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THE INFLUENCE OF CO-TAUGHT INCLUSION ON THE ACADEMIC
ACHIEVEMENT OF THIRD GRADE NON-DISABLED STUDENTS IN
MATHEMATICS

By

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Submitted in Partial Fulfillment
of the Requirements for the Degree

Doctor of Education in Leadership, Management and Policy
Seton Hall University

2011

SETON HALL UNIVERSITY
COLLEGE OF EDUCATION AND HUMAN SERVICES
OFFICE OF GRADUATE STUDIES


APPROVAL FOR SUCCESSFUL DEFENSE

Doctoral Candidate, **Michael Trabucco**, has successfully defended and made the required modifications to the text of the doctoral dissertation for the **Ed.D.** during this **Spring Semester 2011**.

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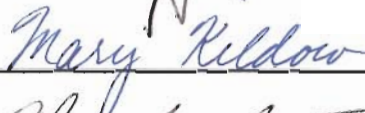
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ABSTRACT

The purpose of this investigation was to examine the academic achievement of non-disabled students educated in co-taught inclusive classrooms and compare it with the academic achievement of non-disabled students educated in non-inclusive [general education] classrooms. Academic achievement was measured by Grade 3 non-disabled students full scale and cluster scores in mathematics on the New Jersey Assessment of Skills and Knowledge. Independent Samples *t* Tests were performed to account for the variability associated with the differences between the sample means for the comparison groups (i.e., inclusion and non-inclusion).

The results of this investigation revealed that there were no statistically significant differences found for overall [full scale] mathematics performance, Geometry and Measurement, Patterns and Algebra, Data Analysis, Probability and Discrete Mathematics, and Problem Solving. A statistically significant difference was found for Number and Numeric Operations specifically, students placed in inclusive classes performed significantly different [better] than students placed in non-inclusion classes.

The findings of this study remain tentative as a result of low statistical power (.34). However, the information obtained in this study when combined with similar findings in the larger context of literature can be beneficial to the parents, teachers and administrators in the school where the data was drawn. For instance, the findings can be used by school administration to parlay the fears of parents who believe that inclusive practices result in lower academic performance of general education students [participants]. The findings can also be shared with school faculty who contend that

inclusion will force them to teach to the middle and not enrich, on or advanced level students. The results should drive local actions to examine this issue more in the school of study.

Future research should focus on: expanding variables, e.g., size and geographic location of school/district, sample diversity in terms of socioeconomic status, gender and ethnicity and incorporating a larger sample size. Such study should sample students across the United States to provide a more comprehensive understanding of inclusive practices on academic achievement.

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ACKNOWLEDGEMENTS

I would like to thank my parents, Theresa and Anthony whose love, kindness, and nurturance, has inspired and sustained me through the rigors of life.

To my wife Karen and children, Nicolas, Mia and Brooke, I wish to express my gratitude for their unconditional love and moral support.

Special thanks to my mentor, Dr. Anthony Colella, first reader, Dr. Christopher Tienken, and dissertation committee members Dr. Mary Kildow and Dr. Linda Freda for their patience, wisdom and ceaseless encouragement.

DEDICATION

This work is dedicated in loving memory of Anthony Trabucco, Jr., my brother,

my best friend.

1952-2010

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Chapter I

INTRODUCTION

“Helping children with disabilities has become part of American education with varying degrees of acceptance and tolerance over the years, and efforts to provide special education have become controversial” (Porfeli, Algozzine, Nutting, & Queen, 2006, p. 6). Today all public school districts provide a continuum of special services and educational programs for disabled students, but it was not always that way. The *Brown v. Topeka Board of Education* (1954) landmark Supreme Court decision, the Civil Rights Act of 1964 (CRA, P.L. 88-352), and the Elementary and Secondary Act of 1965 (ESEA, P.L. 89-10) have all contributed to an equal opportunity to education for all. In the *Brown v. Topeka Board of Education* (1954) the court held that segregated education was inherently unequal based upon the discriminatory nature of racial segregation which violates the Fourteenth Amendment of the United States Constitution by failing to guarantee all citizens equal protection of the law. In the same vein, Congress asserted its authority to legislate under the Fourteenth Amendment of the U.S. Constitution by enacting the Civil Rights Act of 1964 (CRA, P.L. 88-352) which among many protections, prohibited racial segregation in public schools. Congress also authorized the Elementary and Secondary Education Act of 1965 (ESEA) (P.L. 89-10) as a part of President Lyndon B. Johnson's "War on Poverty." President Johnson believed that equal access to education was vital to a child's ability to lead a productive life. The effects of these legislative acts and legal decisions were far-reaching and had tremendous long-term impacts on the whole country. Each has contributed to similar gains for another minority group in America, individuals with disabilities.

Prior to 1975, many disabled children were barred from the public school system. The Department of Public Welfare would arrange for the care, training, and supervision for these children at a private facility not affiliated with the public school system. The practice of excluding children from the public school system was abolished in the US with the passage of the Education for All Handicapped Children Act (EHA, P.L. 94-142). The EHA required all public schools receiving federal funds to provide equal access to education for students with disabilities to ensure the right of every student, regardless of handicapping condition, to a free appropriate public education (FAPE). Public schools were obligated to evaluate disabled students and create an Individual Education Plan (IEP) with parent input that would closely mirror the educational experience of non-disabled students. The EHA was subsequently amended in 1990 and renamed the Individuals with Disabilities Education Act (IDEA, P.L. 101-476).

IDEA set the stage for inclusive education by mandating that public schools must provide FAPE for students ages 3-21 with disabilities in the least restrictive environment (LRE). More specifically, IDEA ensured that “to the maximum extent appropriate, children with disabilities, including children in public or private institutions and other care facilities, are educated with children who are not disabled” (IDEA, 20 U.S.C. § 1412 [a][5]). IDEA was amended by Congress in 1997 (IDEA, P.L. 105-17) and reauthorized in 2004 as the Individuals with Disabilities Education Improvement Act (IDEIA, P.L. 108-446). The language in IDEIA was modified to public schools must provide FAPE to students ages 3-21 with disabilities in the LRE *to the maximum extent possible*.

The No Child Left Behind Act of 2001 (P.L. 107-110), built on the tenets of IDEA, is aligned with the philosophy of educating disabled students in the general

education classroom and in systems of accountability. In an era of education reform movements that require LRE, accountability, and transparency, educators are continually examining variables that impact student achievement on high-stakes state assessments. A question that has been asked in the past is, what influence does the inclusion of students with disabilities in the general education classroom have on both disabled and non-disabled student achievement (Peltier, 1997; Salend & Duhaney, 1999).

Research suggests that including students with disabilities in the general education classroom has been found to be related to beneficial educational and social outcomes for students with disabilities (Rea, McLaughlin, & Thomas, 2002; Waldron, 1997). Specifically, inclusive practices have generated higher levels of achievement and more appropriate social behavior/improved social competence for students with disabilities (Fryxell & Kennedy, 1995). Inclusion has also resulted in: greater communication and developmental skills for disabled students (Bennett, Deluca & Burns, 1997); increased acceptance by their peers (Sharpe, York, & Knight 1994; Walther-Thomas, Bryant & Land, 1996); increased propensity to make more friends in the general education classroom; and interaction with their peers at a much higher level (Fryxell & Kennedy, 1995). Research clearly supports the benefits of inclusion for disabled students.

Research on the effects of inclusion on non-disabled students is less extensive and not as promising. Empirical research concerning the impact of inclusion on non-disabled students' academic achievement has resulted in mixed outcomes (Fletcher, 2010; Staub & Peck, 1995). The existing body of literature typically focuses on the affective gains for non-disabled students such as empathy, increased self-esteem, and a sense of responsibility (Logan et al., 1995; Peltier, 1997). The literature is also vague as to, if and

how, placement in a co-taught inclusive classroom influences the academic achievement of non-disabled students at the elementary level. The mere act of “introducing best practices (e.g., cooperative learning) into a school does not automatically result in improved achievement” (Jenkins, Jewell, Leicester, Jenkins, & Troutner, 1991, p. 319). Due to limited empirical research data, further investigation into the influence of co-taught inclusion on the academic achievement of non-disabled students at the elementary school level is warranted.

Statement of the Problem

Over the last decade, the federal government has directed schools to provide, to the maximum extent possible, educational instruction for students with a variety of disabilities in general education classrooms (Fletcher, 2010). All public schools receiving federal funds must provide equal access to education for students with disabilities, to ensure the right of every student, regardless of handicapping condition, to a free appropriate public education (FAPE) in the least restrictive environment (LRE). Specifically, students with disabilities should be educated with their nondisabled peers to the maximum extent appropriate and special classes, separate schooling, or other removal of students from the regular educational environment should only occur if the nature or severity of the disability is such that education in regular classes with the use of supplemental aids and services cannot be achieved satisfactorily (34 C.F.R. Section 300.550). As such, the inclusive schooling movement has increasingly become the standard used to restructure special education delivery systems today. Federal mandates such as, the No Child Left Behind Act of 2001 and the Individuals with Disabilities Education Improvement Act of 2004, stipulate equal education for all and statewide

systems of accountability based upon rigorous academic standards and assessments. The outcome of high-stakes, standards driven state assessments, determines whether schools are categorized as making adequately yearly progress (AYP) toward the 2014 target of 100 percent proficiency for all students or deemed in need of improvement (NCLB, P.L. 107-110). Consequently, student performance has become a primary indicator of success or lack of success for students, teachers, administrators, schools, and school systems (Ward, Montague, & Linton, 2003).

To meet rigorous standards, teachers are now encouraged to differentiate instruction for a greater range of student ability levels. Implicit in this statement is the belief that accommodating the needs of a few may place the learning opportunities of the many at risk (York & Tundidor, 1995). Herein resides the problem; schools are required to make predetermined AYP levels regardless of where the students start academically and despite the disparity in student ability level attributed to the increased number of disabled students in the general education [inclusive] classroom. Will the time required to meet the academic, social, and/or behavioral needs of disabled students take away from instructional time for non-disabled students? How does this classroom dynamic influence the delivery of instruction and in turn, academic performance of students? Does the introduction of a special education certified co-teacher address potential limitations of the current one size fits all approach to education? Answers to these questions have become increasingly important in an era of education reform movements that require accountability and transparency.

“Although questions about the integration of students with disabilities should no longer be controversial, passionate discussion about inclusion continues to escalate not

only because its philosophy focuses on students with disabilities of any type and severity level but also because it seeks to alter the education of all students and hence general education” (Kavale & Forness, 2000, p. 279). With the growing number of students served and specific provisions in legislation calling for more access to the general curriculum for these students, research on inclusive practices is imperative to understand its effects and barriers to overcome (USDOE, 2009). While there is some evidence on the positive effects of inclusion for students with disabilities, there is less evidence on the effects of inclusion on the classmates of students with disabilities and even less research on the effects of inclusion policies on classmates during early elementary grades (Fletcher, 2010). Peltier (1997) in his review of the literature on the effect of inclusion on non-disabled children concluded, “inclusive education does not negatively affect typical students' academic growth”(p. 234). Similarly, Salend and Duhaney (1999) in their review of the literature with respect to inclusion programs and students with and without disabilities concluded, “the placement of students without disabilities in inclusion programs does not *appear* to interfere with their academic performance” (p. 114). However, limited conclusive empirical evidence exists to either confirm or refute whether non-disabled students' academic achievement is affected by the addition of a special education co-teacher in the inclusive classroom. As a result, this study will focus on one aspect of inclusion, the influence of co-taught inclusion on the academic achievement of non-disabled students. The outcome of this study is relevant to most of the educational constituencies that express concern about the potential impact of inclusion on general education students.

Purpose of the Study

The purpose of this study is to determine the extent to which placement in a co-taught inclusive setting correlates with non-disabled students' academic achievement. Specifically, an analysis of the influence of the independent/grouping variable of co-taught inclusion (general and special education teacher and general and special education students) on the dependent variable of academic performance as measured by Grade 3 non-disabled students overall and cluster scores in mathematics on the New Jersey Assessment of Skills and Knowledge (NJ ASK). By concentrating on variables that can influence student achievement, that is, teaching modality and class placement, this study aims to produce research-based evidence to assist educators, legislators, and parents in the design, implementation and/or choice of instructional programs that maximize learning and therefore, achievement.

Research Questions and Hypotheses

The present study is guided by the following research questions:

Research Question 1: What is the influence of placement in the co-taught inclusive setting on the performance of Grade 3 non-disabled students in the area of mathematics as measured by the NJ ASK?

Sub-question a: What is the difference in Number and Numerical Operations cluster scores as measured by the New Jersey ASK 3 for non-disabled students assigned to co-taught inclusive mathematics class verses non-inclusive class?

Sub-question b: What is the difference in Geometry and Measurement cluster scores as measured by the New Jersey ASK 3 for non-disabled students assigned to co-taught inclusive mathematics class verses non-inclusive class?

Sub-question c: What is the difference in Patterns and Algebra cluster scores as measured by the New Jersey ASK 3 for non-disabled students assigned to co-taught inclusive mathematics class verses non-inclusive class?

Sub-question d: What is the difference in Data Analysis, Probability and Discrete Mathematics cluster scores as measured by the New Jersey ASK 3 for non-disabled students assigned to co-taught inclusive mathematics class verses non-inclusive class?

Sub-question e: What is the difference in Problem Solving cluster scores as measured by the New Jersey ASK 3 for non-disabled students assigned to co-taught inclusive mathematics class verses non-inclusive class?

Based on the research questions posed, the following hypothesis was formulated:

H_0^1 : There is no significant difference in the performance scores in mathematics on the New Jersey ASK 3 for non-disabled students assigned to co-taught inclusive mathematics class verses non-inclusive mathematics class.

Significance of the Study

This study can potentially provide information on the extent to which exposure to special education co-teacher in the inclusive setting correlates with non-disabled students' academic achievement at the elementary school level. There is particularly little research on the effects of inclusion policies on non-disabled students during early elementary grades (Fletcher, 2010). With a growing number of students served and specific provisions in legislation calling for more access to the general curriculum for these students, research on inclusive practices is imperative to understand its effects and barriers to overcome (USDOE, 2009). The data generated from this study can assist

educators, legislators, and parents in the design, implementation, and/or choice of instructional programs offered.

Limitations

There are several limitations that are relative to this study. This study was limited to one school in a suburban school district in northern New Jersey. This study was further limited by a lack of student diversity; the participants of this study were primarily Caucasian students from middle to upper middle class socioeconomic backgrounds. Finally, this study may be potentially limited by the lack of random assignment of non-disabled students to both groups being assessed; school district assignment of non-disabled students to inclusion classrooms was made by school district administrators prior to the onset of this study.

Delimitation

The scope of this study was delimited to the influence that exposure to the special education co-teacher in the inclusive setting has on the academic achievement of Grade 3 non-disabled students as measured by mathematics scores on the NJ ASK. The variables of: language arts performance on the NJ ASK, Limited English Proficiency (LEP), academic achievement of disabled students assigned to inclusive classrooms, number [percentage] of disabled students assigned to inclusive classrooms, teacher training and years of teaching experience were not assessed in this study. It is essential to stress the impracticality of including all potential variables that may influence student achievement into this data collection, for example, IEP requirements, individual state core curriculum content standards and instructional series.

Theoretical Framework

Undoubtedly, recent education reform movements such as NCLB have spawned debate over the emphasis placed on student performance as a primary indicator of success or lack of success for schools and/or school systems. To meet rigorous state and federal standards, *exposure* (to the general education curriculum) has become the buzz word and the inclusive schooling movement has increasingly become the standard used to restructure special education delivery systems today. As a result, teachers are now encouraged to differentiate instruction for a greater range of student ability levels.

One way to offset the effects of current mandates is to add a special education co-teacher into the general education inclusive classroom. This study is guided by the principle of providing complementary knowledge and skills to influence student outcomes; “general education teachers and special education teachers bring a tremendous amount of knowledge and skills to the task of teaching, and by being paired together, they pool their expertise” (Luzader, 1995, p. 19). According to Luzader (1995), general education teachers have a more in-depth understanding of specific curricula or subject areas being taught, whereas special education teachers generally know more about modifying and breaking down the curriculum and adapting methodologies to meet the needs of individual children. By combining the two teachers (inclusion), general and special education children will benefit from a lower student to teacher ratio, access to a wider range of instructional strategies, and increased collaborative teacher support (Cook & Friend, 1995). This study is further directed by Education Production Function Theory.

Education Production Function Theory is based on how various inputs affect a student’s learning in terms of measured outputs (Pritchett & Filmer, 1997). More

specifically, “education production functions are a way to explore the relationship between schooling inputs and the outcomes they are intended to produce”(American Institute for Research, 2010, p.1). In the present study, this comprehensive and heuristic theoretical framework emphasizes the importance of understanding academic achievement (output as measured by standardized tests) in terms of investigating the variables (input(s) classroom placement and teaching modality) that influence the outcomes. The New Jersey Department of Education utilizes education production functions as a measure of academic achievement [output] in the form of standardized test results.

Previous research concerning the impact of inclusion on non-disabled student’s academic achievement has yielded mixed outcomes (Daniel & King, 1997; Fletcher, 2010; Huber, Rosenfeld, & Fiorello, 2001; Hunt, Staub, Alwell, & Goetz, 1994; Kalambouka, Farrell, Dyson, & Kaplan, 2007; Manset & Semmel, 1997; Saint-Laurent, Dionne, Giasson, & Royer, 2002; Sharpe, York & Knight, 1994; Staub & Peck, 1995). The conclusions drawn from research depends upon the population being served (e.g., type and level of disability) and the interrelated conditions in the particular study (e.g., model of inclusion, years of teacher experience, class size).

Numerous researchers have examined the available body of literature on co-teaching (Friend & Reisling, 1993; Murawski & Swanson, 2001; Scruggs, Mastropeiri, & McDuffie, 2007; Weiss, 2004; Welch, Bronell, & Sheridan, 1999). The results vary tremendously. Limited conclusive empirical evidence exists to either confirm or refute whether non-disabled students’ academic achievement is affected by the addition of a special education co-teacher in the inclusive classroom.

Theoretically, teaching modality and class placement in some form should influence student achievement. Support in the literature could not be found; mixed outcomes are reported on the influence of these factors on academic achievement. The objective of this study is to test the influence of teaching modality and class placement [educational inputs] on the academic achievement of non-disabled students [educational output], given recent educational reform initiatives.

Definition of Terms

1. *Academic Achievement/Performance* – was measured by individual non-disabled student scores on the New Jersey Assessment of Skills and Knowledge (NJ ASK) for grade 3 in mathematics. The tests are designed to assess how well students are learning the knowledge and skills called for by New Jersey’s Core Curriculum Content Standards.
2. *New Jersey Assessment of Skills and Knowledge (NJ ASK)* - is a criterion-referenced standards-based standardized test designed to measure the extent to which all students at the elementary-, middle-, and secondary-school levels have attained New Jersey’s Core Curriculum Content Standards (CCCS) in Language Arts Literacy (LAL), mathematics and science (excluded in grade 3).
3. *New Jersey Proficiency Assessment of State Standards (NJ PASS)* is a criterion-referenced standards-based standardized test designed to measure the extent to which all students at the elementary school levels have attained New Jersey’s Core Curriculum Content Standards (CCCS) in Language Arts Literacy (LAL) and mathematics.

4. *Cluster Area Scores* – refers to scores on the five content clusters specifically, Number and Numerical Operations, Geometry and Measurement, Patterns and Algebra, Data Analysis, Probability and Discrete Mathematics and Problem Solving in mathematics on the NJ ASK.

5. *Classroom Setting* – refers to student placement in either a non-inclusive or inclusive instructional setting.

6. *Teaching modality* - the instructional method through which the curriculum is delivered. Instruction can be delivered by a single teacher as in general or special education classes or by a pair of teachers as in co-teaching.

7. *Co-teaching* – also known as team teaching, cooperative teaching or collaborative teaching, is the process by which a general educator and a special educator teach together in an inclusive classroom (Stuart et al., 2006).

8. *Mainstreaming* – placement of special education students in one or more general education classes; mainly electives, specials and lunch

9. *Inclusion* – educating disabled students with their non-disabled age appropriate peers, to the maximum extent appropriate with appropriate aids and supports in the general education classroom in the school the student would attend if not disabled.

10. *General Education* – the instructional practice of educating non-disabled students separate from their disabled peers.

11. *Special Education* - instruction that is specially designed to meet the unique needs of a child with a disability typically associated with an Individual Education Plan. Specifically, education that is developed to address an individual child's needs that stem from his or her disability.

12. *Disabled Student* – refers to a student who has been classified with a disability under IDEIA (P.L. 108-446) and New Jersey Administrative Code 6A:14-3.5 specifically, Auditorily Impaired, Autistic, Cognitively Impaired, Communication Impaired, Emotionally Disturbed, Multiply Disabled, Deaf/Blindness, Orthopedically Impaired, Other Health Impaired, Social Maladjustment, Specific Learning Disability, Traumatic Brain Injury, Visually Impaired or; Section 504 of the Rehabilitation Act of 1973 (Section 504, 29 U.S.C. § 794) specifically, a physical or mental disability that substantially impacts a major life activity e.g., walking, hearing, breathing, learning and; based on specific procedural requirements for the identification, evaluation, placement and procedural safeguards of preschool, elementary and secondary students.

13. *Non-disabled Student* – also known as a general education student, refers to a student who has not been classified with a disability under IDEA, New Jersey Administrative Code 6A:14-3.5 or Section 504 of the Rehabilitation Act of 1973.

14. *Inclusive Class* – the general education setting where disabled and non-disabled students are educated.

15. *Non-inclusive or General Education Class* - the education setting where non-disabled students are educated.

16. *Special Education Class* - the education setting where disabled students are educated, i.e., resource center, self-contained classes (Multiply Disabled, Autism, Behavioral Disabilities, Learning and Language Disability).

17. *Least Restrictive Environment* – refers to the provision in the IDEA mandates requiring to the maximum extent appropriate that students with disabilities ages

three through 21 are educated with non-disabled children and participate in nonacademic and extracurricular activities with non-disabled children (IDEA, 20 U.S.C. § 1412 [a][5]).

Chapter II

REVIEW OF THE LITERATURE

Introduction

It remains unclear in the literature if and how placement in a co-taught inclusive classroom influences the academic achievement of non-disabled students at the elementary level. What is clear is that the number of students with disabilities served under IDEIA continues to increase at a rate higher than the general population (USDOE, 2007). Moreover, schools are required to make predetermined AYP levels regardless of where the students start academically and despite the disparity in student ability level attributed to the increased number of disabled students in the general education [inclusive] classroom. With a growing number of students served and specific provisions in the amendments calling for more access to the general curriculum for these students, research on inclusive practices is imperative to understand its effects and barriers to overcome (USDOE, 2009).

The purpose of this study is to determine the extent to which placement in co-taught inclusive setting correlates with non-disabled students' academic achievement. Specifically, an analysis of the influence of the independent/grouping variable of co-taught inclusion (general and special education teacher and general and special education students) on the dependent variable of academic achievement as measured by Grade 3 non-disabled students overall and cluster mathematics scores on the New Jersey Assessment of Skills and Knowledge (NJ ASK).

The review of the literature is divided into the following four sections and a summary: (a) Historical Development of Inclusion, (b) Inclusion, (c) Co-teaching, (d)

Academic Achievement and Inclusion: Empirical Studies on Outcomes for Non-disabled Elementary Students, and (e) Summary.

Literature Search Procedures

The literature reviewed for this chapter pertained to inclusion and academic achievement. The articles and research examined were accessed via online databases including ERIC, PsycARTICLES, PsycINFO, ProQuest, EBSCOhost, and Academic Search Premier. An electronic search was also conducted utilizing Google and Yahoo Education, ED.gov (research and statistics), state.nj.us/education, and peer-reviewed educational journal websites. The key terms and phrases used in searches were: history and inclusion, history and special education inclusion, inclusion, special education inclusion, co-taught inclusion, co-teaching, impact of inclusion on non-disabled students, impact of inclusion on disabled students, academic achievement, academic performance, gender gap, gender gap and mathematics, and NJ ASK. The aforementioned terms and phrases were used in isolation or combination to produce search results. Finally, studies that met the following criteria were included: used experimental, quasi-experimental, non-experimental with control groups, or another design that would be considered at least causal-comparative; were peer-reviewed or government reports; reported at least statistical significance; were published within the last 30 years unless considered a seminal work [hence older]; and included the use of inclusion as one intervention.

Historical Development of Inclusion

Since its inception the field of education has undergone many evolutions. Today all public school districts provide a continuum of special services and educational programs for disabled students, but it was not always that way. The *Brown v. Board of*

Education (1954) landmark decision which extended equal protection under the law to minorities, the Civil Rights Act of 1964 (CRA, P.L. 88-352) which outlawed racial segregation in schools, and the Elementary and Secondary Act of 1965 (ESEA, P.L. 89-10) enacted to address the problem of inequity in education all contributed to set the stage for similar gains for individuals with disabilities. As recently as 1974, one million children with disabilities remained at home or were institutionalized rather than included in the public school system (National Association of State Boards of Education, 1992).

The ESEA was reauthorized in 1975 as the Education for All Handicapped Children Act (EHA, P.L. 94-142). The EHA required all public schools receiving federal funds provide equal access to education for students with disabilities to ensure the right of every student, regardless of handicapping condition, to a free appropriate public education (FAPE) in the least restrictive environment (LRE). More specifically, students with disabilities should be educated with children who are nondisabled to the maximum extent appropriate and special classes, separate schooling, or other removal of students from the regular educational environment should only occur if the nature or severity of the disability is such that education in regular classes with the use of supplemental aids and services cannot be achieved satisfactorily (34 C.F.R. Section 300.550). Public schools were also required to evaluate disabled students and create an Individual Education Plan (IEP) with parent input that would closely emulate the educational experience of non-disabled students.

To meet EHA requirements, disabled students were moved from separate schools and classes to general education mainly for electives, specials and lunch; a practice termed “mainstreaming” (Zigmond, 2003). Disabled students continued to receive the

majority of their academic instruction in self-contained and resource center rooms. In 1983, *A Nation at Risk: The Imperative for Educational Reform* was published by President Reagan's National Commission on Excellence in Education. The report found academic underachievement at nearly every level nationally and warned that "the educational foundations of our society are presently being eroded by a rising tide of mediocrity that threatens our very future as a Nation and a people" (U.S. Department of Education, 1983, p. 9). Owing to the perceived failure, public schools attempted to reorganize or restructure the way services were delivered to both special and the general education students.

Mainstreaming as described continued into the 1980s until the Education Reform Initiative (REI) gained momentum. REI was introduced in 1986 and called for general education teachers to become more responsible for the education of disabled students. The EHA was amended in 1990 and renamed the Individuals with Disabilities Education Act (IDEA, P.L. 101-476).

IDEA provided a framework for how schools delivered special education, related services and FAPE for student's ages 3-21 that were deemed eligible based upon 13 specified categories. Students continued to be educated under the provision of least restrictive environment (LRE). Categories include autism, deafness, deaf-blindness, hearing impairments, mental retardation, multiple disabilities, orthopedic impairments, other health impairments, serious emotional disturbance, specific learning disabilities, speech or language impairments, traumatic brain injury, and visual impairment. IDEA ensured that "to the maximum extent appropriate, children with disabilities, including

children in public or private institutions and other care facilities, are educated with children who are not disabled” (IDEA, 20 U.S.C. § 1412 [a][5]).

Throughout the 1990s, education reform focused on educational excellence and accountability; The Goals 2000: Educate America Act (P.L. 103-227) shifted the focus of education reform to outcomes-based education. In spite of this, “students with disabilities continued to be served in separate classrooms, taught a different curriculum, and excluded from participation in the large-scale national, state, or district assessments used to measure achievement” (Bechard, 2000, p.3). In 1994, the United States Department of Education (USDOE) enlisted the support of the Office of Special Education Programs (OSEP) to examine how states were fairing with compliance of Federal education laws (Rudd, 2002). OSEP determined that a vast range in placement patterns existed coupled with continuing findings that states were failing to implement LRE requirements (Lipsky & Gartner, 1997). OSEP issued policy guidelines indicating that school districts could not use the excuse of lack of adequate personnel or resources as an excuse for failing to provide FAPE in the LRE, for students with disabilities. As a result of the OSEP findings and ongoing parental litigation, IDEA was amended by Congress in 1997 (IDEA, P.L. 105-17).

The 1997 version of IDEA clarified and strengthened the original concept of LRE (Snyder, Garriott, & Aylor, 2001) and sought to align general and special education reforms (Bechard, 2000). Rather than focus predominantly on the processes and programs required by law, student participation and performance in the general education curriculum became the focus. IDEA was subsequently reauthorized in 2004 as the Individuals with Disabilities Education Improvement Act (IDEIA, P.L. 108-446). IDEIA

maintained the basic principles of the law but was modified to include public schools must provide FAPE to students ages 3-21 with disabilities in the LRE *to the maximum extent possible*; IDEIA also stipulates highly qualified teacher requirements; provision for services for homeless disabled children; modified state performance goals for children participating in state and local testing; and modifications to the IEP process and other aspects of the identification and evaluation of students with disabilities.

In addition to federal and state legislation, recent court decisions have supported students' rights to be included in the general education classroom. During the past 20 years, four federal district courts have supported students' right to inclusion. In *Daniel R.R. v. State Board of Education* (U.S. Court of Appeals (5th Cir.), 874 F.2d 1036, 1989), the parents of a 6-year old boy with Down Syndrome sued the school district under the Education of the Handicapped Act ("EHA"). The trial court found in favor of the school district. The parents appealed, but the Appellate Court affirmed the trial court's decision. In affirming the lower court's decision, the Appellate Division addressed mootness, procedural violations and the mainstreaming requirements under the EHA.

With respect to mootness, the Court held that due to the lengthy process of administrative and judicial procedures, issues surrounding the appropriateness of an IEP would typically evade appellate review. Therefore, the Court held that appeals on the merits of such cases should be heard despite the fact that issues and timeframes in question may have already passed. Also, despite the parents' allegations of substantive procedural violations under the EHA, the Appellate Court agreed with the trial court finding that such claims were without merit.

Lastly and most importantly, the Court addressed the EHA's mainstreaming requirement. The Court examined whether the school had taken steps to accommodate the disabled student in the general education class with appropriate supplementary aids and services. The Court noted that a general education placement is appropriate if a disabled child can receive an appropriate [satisfactory] education even if it is not the preeminent academic program for the child. Academic achievement is not the only purpose of mainstreaming and non-academic benefits must also be considered. In holding that the child was mainstreamed to the maximum extent appropriate by the school district, the Appellate Court also affirmed the lower court's finding that the needs of the non-disabled students must also be considered with respect to programming and placement of disabled children.

In *Greer v. Rome City School* (U.S. Court of Appeals (11th Cir.), 950 F.2d 688, 1991) a parent challenged the school district's proposed placement and Individualized Education Plan (IEP) of a 10 year old girl with Down Syndrome, alleging it violated the *Least Restrictive Environment* ("LRE") requirement of IDEA. LRE requires disabled children to be educated to the maximum extent appropriate, with children who are not disabled. The lower court ruled in favor of the parent finding that the school district did not sufficiently mainstream this student. The district appealed, but the Appellate Court affirmed the trial court's decision in favor of the parent.

The Appellate Court applied a two-part test to determine whether the district complied with the mainstreaming requirement under the IDEA. First, the Court examined "...whether education in the regular classroom, with the use of supplemental aids and services, can be achieved satisfactorily." Secondly, the Court looked to whether

the school mainstreamed the student to the maximum extent appropriate. Using this two-part test, the court ruled against the district citing that the IEP team failed to consider the full continuum of placements in determining the LRE; the school made no attempt to assist the student to remain in the mainstream setting; and the school district developed the IEP prior to the IEP meeting and did not clearly inform the parents of the full range of services that may have been required to maintain their child in the general education classroom.

The case of *Oberti v. Board of Education of the Borough of Clementon School District* (U.S. District Court (3rd Cir.), 995 F.2d 1204, 1993) involved an 8 year old boy with Down Syndrome, who was removed from the regular classroom by school district and placed in a segregated special education class. The parents of the child sued, alleging that the school district violated the mainstreaming requirement of the IDEA. The trial court agreed and ruled in favor of the parents. The district appealed.

The Appellate Court specifically held that the district has the burden to prove compliance with the IDEA's mainstreaming requirement despite who filed for due process. The Court then determined that the district failed to prove that this student could not be educated satisfactorily in the regular education program with the use of supplementary aids and services. The Court ruled that school districts were obligated to first consider regular class placement, with supplementary aids and services, before considering alternative placements. The Court found that the self-contained special education class was not the least restrictive environment and that this student had a right under IDEA to be educated in a regular classroom with nondisabled classmates.

In *Sacramento City Unified School District v. Holland* (U.S. Court of Appeals (9th Cir.), 14 F.3d 1398, 1994), the parents of an 11 year old mentally disabled girl sued the school district challenging its decision to place her in a split program (50% special education classroom and 50% general education classroom). The parents were seeking a full-time general education placement. The hearing officer and the lower court ruled in favor of the parents ordering the district to place the student in a general education program full-time. The District appealed the orders, but the Appellate Court affirmed the decision in favor of the parents.

The district contended that the child was severely disabled and would not benefit from a full-time general education placement. This Court also applied the two-part test for determinations regarding compliance with the mainstreaming requirement. As previously mentioned, the two part test pertained to "...whether education in the regular classroom, with the use of supplemental aids and services, can be achieved satisfactorily" (*Sacramento City Unified School District v. Holland*, 1994, p. 3) and whether the school mainstreamed the student to the maximum extent appropriate. Additionally, it also held that the burden to prove that the student could not be appropriately educated in a mainstream classroom with supplementary aids and services lies with the school district. The Appellate Court, agreeing with the lower court that the district failed to meet its burden, found that the appropriate placement for the student under the IDEA was a full-time general education program in the second grade classroom with supplemental services.

Case law is only one force shaping education in the United States today. A powerful driving force behind education reform in the 21st century can be found in the

tenets of the No Child Left Behind Act of 2001 (P.L. 107-110). A central focus of NCLB is to improve the performance of U.S. schools by increasing the standards of accountability for states, school districts, and schools. Built on the requirements initially established by IDEA, NCLB funds a number of federal programs focused on: making adequate yearly progress (AYP) on high stakes standards driven state assessments (accountability); providing all students with an equal opportunity to learn (LRE); and making public the disaggregated performance data for students by poverty, race/ethnicities, disabilities and limited English proficiencies (transparency). Specifically, states must test at least 95 percent of their students with disabilities, include those scores in school ratings and provide test results to the public in the form of school report cards; learning is expected of all children and performance of all schools.

The public has responded critically to these new requirements. Some policymakers view this reform as an important next step in ensuring that every student receives a high-quality education. Inclusion is a response to this restructuring and represents a movement seeking to create schools that meet the needs of all students by establishing learning communities to educate students with and without disabilities together in age appropriate, general education classrooms in neighborhood schools (Kavale & Forness, 2000). “Although questions about the integration of students with disabilities should no longer be controversial, passionate discussion about inclusion continues to escalate not only because its philosophy focuses on students with disabilities of any type and severity level but also because it seeks to alter the education of all students and hence general education” (Kavale & Forness, 2000, p. 279).

Nearly a decade into the 21st century and more than 25 years since the release of *A Nation at Risk: The Imperative for Educational Reform*, “the rising demands of our global economy, together with demographic shifts, require that we educate more students to higher levels than ever before” (U.S. Department of Education, 2008, p. 1). In 2008, the U.S. Department of Education published *A Nation Accountable: Twenty-five Years After A Nation at Risk*, which reviewed the educational progress made since the original report’s release in 1983. The report found the original warnings to be relevant and poignant. “If we were “at risk” in 1983, we are at even greater risk now. The rising demands of our global economy, together with demographic shifts, require that we educate more students to higher levels than ever before. Yet, our education system is not keeping pace with these growing demands” (U.S. Department of Education, 2008, p.1). Clearly, raising the proficiency level for all students continues to be a priority in public schooling today.

In summation, economic growth and the spread of civil rights and democracy have elevated the value of education and amplified the importance of ensuring that all children have access to a high-quality education. In response to the shifting political and social culture in America, education reform efforts during the past 60 years have changed the landscape of education from separate to separate but equal to equal access for all. The *Brown v. Topeka Board of Education* (1954) landmark Supreme Court decision, the Civil Rights Act of 1964 (CRA, P.L. 88-352), and the Elementary and Secondary Act of 1965 (ESEA, P.L. 89-10) have all contributed to an equal opportunity to education in the U.S.. Federal initiatives such as IDEA and NCLB have set the stage for inclusive education through FAPE, LRE, and testing mandates. Recent Supreme Court decisions

(e.g., *Daniel R.R. V. State Board of Education*, *Greer v. Rome City School*, and *Oberti v. Board of Education of the Borough of Clementon School District*) have also contributed to ensuring the rights of students to be *included* in the general education classroom by upholding the Fourteenth Amendment rights all students.

Inclusion

The inclusive schools movement has increasingly become the standard used to restructure special education delivery systems today. Over the last decade, the federal government has directed schools to provide educational instruction for students with a variety of disabilities into general education classrooms (Fletcher, 2010). To that end, policy and practice on the education of children with disabilities has been aimed at educating increasing numbers of students in an inclusive school environment (Kalambouka et al., 2007; Yell & Shriner, 1996). “Between 1995 and 2005, the percentage of students with disabilities spending 80 percent or more of their school day in a general education classroom showed an overall increase from 45 to 52 percent; there was an overall decline (from 22 to 18 %) in the percentage of students with disabilities spending less than 40 percent of their day in general education” (USDOE, 2007, p. 68).

“The term “inclusion” is not a legal term and therefore does not appear in IDEA or any subsequent reauthorization. “Inclusion is more than court decisions, pronouncements, and policy statements” (National Study of Inclusive Education, 1994, p. 14); it is a philosophy (Inos & Quigley, 1995). Although not found in any law, the term is commonly used when referring to the implementation of IDEA's LRE provision. Specifically, educating disabled students with the use of supplementary aids and services in the regular classroom in the school the student would attend if not disabled (IDEIA,

2004). The LRE is the first placement option considered for each disabled student to *the maximum extent possible*, before a more restrictive placement is considered (Wright & Wright, 2010).

While there are multiple definitions of inclusion, present use of the term refers to the instructional practice of educating disabled students by means of the general curriculum for the majority of the school day in the general education classroom (Hocutt, 1996). Generally speaking, inclusion does not simply mean the placement of students with disabilities in general education classes rather, it means:

Providing to all students, including those with severe handicaps, equitable opportunities to receive effective educational services, with the needed supplementary aids and support services, in age-appropriate classes in their neighborhood schools, in order to prepare students for productive lives as full members of the society (National Study of Inclusive Education, 1994, p.5)

The term inclusion has also been used synonymously with the term mainstreaming. Inclusion is differentiated from mainstreaming in that included students are members of the general education class and are not enrolled in any other specialized educational environment based on disability (Halvorsen & Neary, 2001). Organizations such as the National Center on Educational Restructuring and Inclusive Education (NCERI) have attempted to study this phenomenon in greater detail.

In 1994, NCERI conducted a national survey (National Study of Inclusive Education, 1994) to investigate the inclusive schools reform movement. Key findings of this study were found to include: programs [inclusion] are taking place in a wide range of locations, i.e., urban, suburban, rural, large and small districts; students with each of

IDEA's classifying conditions are included; comprehensive program evaluations of inclusive programs are limited; and teachers fear lack of adequate resources over time. NCERI subsequently conducted a study in 1995 to identify key factors of inclusive education practices. Key findings suggest: (a) outcomes for students in inclusive education programs are positive; (b) teachers participating in inclusive education programs report positive outcomes for themselves; (c) the range of disabilities in inclusive programs is increasing; and (d) school restructuring efforts are having an impact on inclusive education programs. As with any reform initiative, the inclusive schools movement has been met with mixed reviews.

Proponents of inclusion argue in favor of the many advantages afforded students with disabilities who are instructed in the general education setting. Research indicates that including students with disabilities in general education classrooms has been found to be related to beneficial educational and social outcomes for these students (Baker, Wang, & Walberg, 1994; Rea, McLaughlin, & Thomas, 2002; Waldron, 1997). Rea et al. (2002) investigated the relationship between placement in inclusive and pullout special education programs. The study also examined academic and behavior outcomes for students with disabilities. The researchers concluded that disabled students in inclusive classrooms earned higher grades, achieved higher or comparable standardized test scores, committed no more behavioral infractions, and attended more days of school when inclusion was implemented with adequate adaptations, sufficient time for planning, ample personnel and individualized programming. Baker et al. (1994) conducted a meta-analysis of research concerning inclusion's effects on student learning and social relations with classmates. The effect size (Social Effect Size .28; Academic Effect Size .08) of the

meta-analyses demonstrated a small-to-moderate beneficial influence of inclusive education on disabled students' academic and social outcomes. Similarly, Waldron (1997) completed an extensive literature review on inclusion and inclusive school programs. The researcher concluded that while the results are mixed and there seems to be investigations to support the position of both proponents and opponents of inclusion, "there is some evidence of improved academic achievement outcomes for students with disabilities in inclusive settings" (p. 509). The researcher further concluded that proponents of the inclusive school movement have often focused on "issues of equality in education and the need for students with disabilities to function effectively in the general education setting" (Waldron, 1997, p. 503).

Inclusive education practices have also been found to generate higher levels of achievement, more appropriate social behavior and improved social competence for students with disabilities, and increased acceptance of disabled students in the general education setting (Baker & Zigmond, 1995; McDonnell et al., 2003; Saint-Laurent et al., 1998). Baker and Zigmond, (1995) examined overall themes arising from five case studies of elementary schools implementing inclusive models for students with learning disabilities. The researchers found a small to moderate effect of inclusion on the academic and social outcomes of students with learning disabilities. In the same vein, Saint-Laurent et al., (1998) studied the academic achievement effects of inclusion on disabled and non-disabled students. The researchers reported improved self-esteem for disabled students, increased acceptance of disabled students by the non-disabled peers and significant gains on writing scores for disabled students. Finally, McDonnell et al. (2003) examined the achievement of students with developmental disabilities in inclusive

classrooms, their non-disabled peers, and students in non-inclusive classes. Disabled students made gains in adaptive behavior and were able to meet state standards for language arts and math.

Proponents such as Bennett, Deluca, and Burns (1997), have indicated that inclusion has resulted in greater communication and developmental skills for included disabled students. In addition, disabled students experience increased self-esteem and camaraderie by merely participating in general education classes (Ritter, Michel, & Irby, 1999) and tend to make more friends in the general education classroom and interact with their peers at a much higher level (Fryxell & Kennedy, 1995). What is more, Fryxell and Kennedy's study examined the impact of educational placement in either general education or self-contained classrooms on the social life of elementary-age students with disabilities. Results indicated that students placed in general education had more social contact with peers without disabilities, received more social support, and had substantially larger friendship networks. Lastly, inclusive education allows the alignment of special education programs and general education curriculum, raises the expectations of student performance, provides opportunities for students with disabilities to learn and be assessed alongside their typical peers without disabilities, and increases school-level accountability for educational results (U.S. Department of Education, 1999). While proponents point out the many documented advantages of inclusion for disabled students, opponents view inclusion from a very different lens.

Critics of inclusion maintain that full-time placements in the general education setting will prevent some disabled students from concentrated and individualized instruction (Andrews et al., 2000). Opponents claim that inclusion takes away valuable

resources from the disabled student such as resource rooms with a much lower staff to student ratio. Moreover, by placing a student in an inclusive classroom, that student may not have access to special education faculty best equipped to handle his or her needs and as a result, the student at a disadvantage (Kauffman & Hallahan, 2005).

Opponents of inclusion also claim that students have been placed in general education classrooms without proper support (Baines, Baines, & Masterson, 1994; Top, 1996) and general education teachers do not possess the necessary training [qualifications] to teach students with disabilities (Schumm & Vaughn, 1995). Kauffman and Hallahan (1995) posited that disabled students who present with emotional or behavioral issues disrupt the learning environment and threaten how well students learn in the general education setting; general education teachers are often underprepared or unequipped to handle the needs of many special education students for the entire school day. Irmsher (1996) found that the time required to meet the needs of the special education student takes away from instructional time for non-disabled students, non-disabled students were called on to help the teacher instruct disabled students, and specialists were not able to spend enough time with student's who need their services. Finally, Fox and Ysseldyke (1997) discussed the lack of availability of financial resources needed to sustain effective inclusive practices.

While there is some evidence on the positive effects of inclusion on students with disabilities, opponents maintain that there is less evidence of the overall benefit of inclusion on the classmates of students with disabilities (Fletcher, 2010). The extant body of literature on the impact of inclusion on non-disabled students typically focuses on affective gains such as empathy, increased self-esteem and a sense of responsibility

(Peltier, 1997; Salend & Duhaney, 1999; Staub & Peck, 1995). Staub and Peck (1995) conducted a literature review of studies using quasi-experimental designs to compare outcomes of students with and without disabilities in inclusive classrooms. Studies consistently indicated that inclusion did not harm nondisabled students. Students without disabilities generally experienced five positive themes such as: reduced fear of human differences, accompanied by increased comfort and awareness; growth in social cognition; improvements in self-concept; development of personal moral and ethical principles; and warm and caring friendship. Peltier (1997) conducted a comparable review of the research on the effect of inclusion on non-disabled children. The researcher concluded that inclusive education promotes and enhances all students' social growth within inclusive classrooms and does not negatively affect typical students' academic growth. Lastly, Salend and Duhaney (1999) completed a review of the literature pertaining to inclusion programs of students with and without disabilities and their teachers. Findings indicated that the placement of students without disabilities in inclusion programs does not appear to interfere with their academic performance with respect to the amount of allocated and engaged instructional time, the rate of interruptions to planned activities, and the students' achievement scores and report card grades. The researchers further concluded that social performance also appeared to improve because students have a better understanding of and more tolerance for student differences. Research on the effects of inclusion on the academic achievement of non-disabled students is less extensive and not as promising.

Empirical research concerning the impact of inclusion on non-disabled student's academic achievement has resulted in mixed outcomes (Daniel & King, 1997; Fletcher,

2010; Huber, Rosenfeld, & Fiorello, 2001; Hunt, Staub, Alwell, & Goetz, 1994; Kalambouka et al., 2007; Manset & Semmel, 1997; Saint-Laurent et al., 2002; Sharpe, York, & Knight, 1994). Hunt et al. (1994) compared achievement of students from three elementary classrooms with either a less or more severe disability using an inclusion model. Results indicated that students without disabilities were helpful in providing cues, prompts, and consequences for the disabled, and these facilitative activities did not negatively impact the nondisabled level of achievement of the academic objectives identified for the math unit as measured by teacher-made tests. Sharpe et al. (1994) conducted a study to investigate the impact of inclusive school environments on the academic performance of non-disabled students. The researchers compared the academic achievement of non-disabled students educated in an inclusive environment verses those who were not. The overall findings the study did not indicate a decline in educational achievement measures, that is, standardized test scores and report card grades for students who had a classmate with a disability and those who did not. Daniel and King (1997) investigated the effects of elementary students' placement versus non-placement in inclusive classrooms. The researchers concluded that no consistent pattern of academic performance emerged however, the higher incidence of behavior problems in the inclusive classrooms may diminish time on instruction as a result of time devoted to handling these problems. Manset and Semmel (1997) compared eight model inclusive programs in terms of characteristics and outcomes. Results suggested that organizational and instructional changes associated with inclusive programming had a positive influence on nondisabled students' achievement. Saint-Laurent et al. (1998) conducted a study designed to evaluate the impact of an in-class service model [inclusion] on the academic

achievement of students with and without disabilities. Results revealed that non-disabled students were not held back by the presence of disabled students enrolled in the classroom. Huber, Rosenfeld, and Fiorello (2001) studied the differential impact of inclusion and inclusive practices on high, average, and low achieving general students. The analysis of the data suggested that inclusion and inclusive practices may lead to different rates of achievement for general education students. McDonnell, Thorson, Disher, Buckner, Mendel, and Ray (2003) completed an exploratory study which addressed the impact of inclusive educational programs on the achievement of students with developmental disabilities and their non-disabled peers. Results implied that the academic performance of the typical students in reading/language arts and mathematics did not differ by placement. Kalambouka et al. (2007) completed a systematic review of the literature on the impact of placing students with special education needs in mainstream schools on the academic achievement of their peers. “The findings suggest that there are no adverse effects on pupils without special education needs of including pupils with special needs in mainstream schools, with 81% of the outcomes reporting positive or neutral effects” (p. 365). Finally, Fletcher (2010) examined the spillover effects of inclusion of classmates with emotional problems on test scores in early elementary education. The findings showed that students with classmates who have a serious emotional problem score significantly lower than other students, though the results for reading are often not statistically significant.

To sum up, “between 1995 and 2005, the percentage of students with disabilities spending 80 percent or more of their school day in a general education classroom showed an overall increase from 45 to 52 percent” (USDOE, 2007, p. 68). There is a considerable

body of research on the academic, social and emotional benefits of inclusion for non-disabled students (Rea et al., 2002; Sharpe, York, & Knight, 1994; Waldron, 1997; Walther-Thomas, Bryant & Land, 1996). Research on inclusion appears to be, to some extent, dependent on the population studied: inclusion in the preschool is mostly positive; research with the mildly disabled is mixed, and research on inclusion with the severely disabled is mostly positive (Walker & Ovington, 1998). The extant body of literature on the impact of inclusion on non-disabled students typically focuses on the affective gains (Logan et al., 1995; Peltier, 1997). However, empirical research concerning the impact of inclusion on non-disabled student's academic achievement has resulted in mixed outcomes (Fletcher, 2010; Staub & Peck, 1995). Peltier (1997) in his review of the literature on the effect of inclusion on non-disabled children concluded "inclusive education does not negatively affect typical students' academic growth"(p. 234). Similarly, Salend and Duhaney (1999) in their review of the literature with respect to inclusion programs and students with and without disabilities concluded "the placement of students without disabilities in inclusion programs does not *appear* to interfere with their academic performance" (p. 114). Finally, limited conclusive empirical evidence exists to either confirm or refute whether non-disabled students' academic achievement is affected by the addition of a special education co-teacher in the inclusive classroom.

Co-teaching and Inclusion

In response to increased pressure to educate students with disabilities in the general education setting, schools have looked to create appropriate educational settings and service delivery models (Weiss & Lloyd, 2002). Inclusion has been at the forefront of educational reform for many years. A number of pedagogical approaches have been

developed and implemented in school districts across the United States. Research suggests that there is no single model of inclusion; rather, there are several models in terms of differing roles for teachers (Gartner & Lipsky, 1997; NCERI, 1995):

- consultant model – The special education teacher is available to both the student and general education teacher to assist in re-teaching difficult or newly acquired skills and/or advising on curricular issues;
- team model – The special education teacher works with a grade level or is assigned to one or more general education teachers (team) to broaden their knowledge, communicate on curricular, behavioral, and/or instructional strategies/accommodations/modification;
- parallel teaching model – The special education teachers provides in class resource to a small group of students within the general education classroom;
- cooperative teaching model – The special and general educators work together to deliver instruction to disabled and non-disabled students in the general education classroom.

Welch, Brownell, and Sheridan (1999), conducted a comprehensive review of the literature on inclusive service delivery models and concluded that co-teaching has gained enormous interest in recent years as a viable approach of shared responsibility in serving students with special needs in general education classrooms. Specifically, of the many instructional delivery approaches explored, the concept of collaborative team teaching has gained popularity.

Throughout the evolutionary process of cooperative teaching there have been many attempts at defining what the approach looks like, what it felt like and how it can be implemented (Bauwens, Hourcade, & Friend, 1989; Cook & Friend, 1995; Villa, Thousand, & Nevin, 2008). The term *cooperative teaching* was coined by Bauwens, Hourcade, and Friend (1989) to describe a merger between special and general educators through which educational programming would be provided to all students by having a

special educator in the general education classroom. Cook and Friend (1995) subsequently shortened the term *cooperative teaching* to *co-teaching* and clarified the characteristics of the co-teaching relationship; “two or more professionals delivering substantive instruction to a diverse or blended group of students in a single physical space” (p.2). Villa, Thousand, and Nevin, (2008) defined co-teaching as “two or more people sharing responsibility for teaching some or all of the students assigned to a classroom...It involves the distribution of responsibility among people for planning administration and evaluation for a classroom of students” (p. 5). Currently, co-teaching, team teaching, cooperative teaching and collaborative teaching are used synonymously to describe the process by which a general educator and a special educator teach together in an inclusive classroom (Stuart, Connor, Cady, & Zweifel, 2006). Despite the subtle difference in how teams of researchers operationally defined co-teaching, common elements appear in each: working together to deliver instruction; mutual [common] planning, responsibility and assessment; and pedagogical parity among teachers.

The co-taught service delivery method provides all students with the assistance and expertise of two teachers (Austin, 2001) and holds great promise as a way to meet the needs of students with disabilities in general education classrooms (Qi & Rabren, 2009). “General education teachers and special education teachers bring a tremendous amount of knowledge and skills to the task of teaching, and by being paired together, they pool their expertise” (Luzader, 1995, p. 19). Luzader (1995) contends that general education teachers possess a more in-depth understanding about specific curricula or subject areas being taught while special education teachers have better knowledge about modifying the curriculum and adapting teaching methodologies to meet the needs of individual students.

Co-teaching also allows students to experience and imitate the collaborative and cooperative skills that teachers demonstrate when they co-teach (Thousand, Villa, & Nevin, 2006).

Co-teaching is practiced most often in elementary schools, less in middle schools and even less in middle or high schools (Friend, Reisling, & Cook, 1993). Co-teaching is designed to minimize some of the issues with pull-out [replacement] programs such as students missing academic instruction, insufficient communication and coordination among professionals, and fragmentation of the curriculum (Stuart, Connor, Cady, & Zweifel, 2006). Co-teaching schedules may vary by grade level. Co-teachers may spend the entire school day together or interact for only a specified number of instructional periods each day or times during a week. Each of these arrangements can affect the number and depth of co-teaching relationships that teachers could experience (Wischnowski, Salmon, & Eaton, 2004).

Cook and Friend (2000), Friend and Cook (2007) and Vila, Thousand, and Nevin (2008) have identified approaches to co-teaching as a service delivery model. Cook and Friend (2000) identified five models of co-teaching. The models included: (a) one teacher (instructing) and one assistant or teacher drifting; (b) two teachers delivering instruction by means of stations (station teaching); (c) two teachers delivering content to groups within the class (parallel teaching); (d) one teacher instructs while one teacher works with smaller groups to pre-teach, re-teach, or supplement regular instruction (alternative teaching) and; (e) teachers contribute to instruction [share] for the entire class (team teaching). Friend and Cook (2007) later added a sixth, one teacher teaches while one teacher observes and or assists students. The researchers emphasize the importance of

teacher collaboration in addressing issues of roles and responsibilities, delivering instruction, and administration of classroom management and discipline.

Vila, Thousand, and Nevin (2008) identified four models of co-teaching, specifically, supportive co-teaching, parallel co-teaching, complementary co-teaching, and team teaching. In supportive co-teaching, one teacher takes the lead instructional role while the other teacher rotates among the students providing support. Parallel co-teaching occurs when two or more people work with different groups of students in different sections of the classroom. Complementary co-teaching happens when co-teachers do something to enhance the instruction provided by the other teacher. Finally, team teaching “is when two or more people do what the traditional teacher has always done – plan, teach, assess, and assume responsibility for all of the students in the classroom; team teachers share the leadership and responsibility” (p. 21).

Characteristically, co-teaching increases instructional options and professional support for students, improves program intensity and continuity, and reduces the stigma for students (Cook & Friend, 1995). Thousand, Villa, and Nevin (2006) stated that co-teaching has been documented to be effective for students with a variety of instructional needs including students with hearing impairment, learning disabilities, high-risk students with emotional disturbance and other at-risk characteristics, language delays, English-language learners, and students with and without disabilities in secondary classrooms.

Researchers have investigated which factors are associated with successful co-teaching (Arguelles, Hughes, & Schumm, 2000; Bouck, 2007; Walther-Thomas, Bryant, & Land, 1996; Weiss & Lloyd, 2003). Effective co-teaching models have common planning time, flexibility, defined roles and responsibilities, compatibility,

communication skills, and administrative support (Arguelles, Hughes, & Schumm, 2000).

There is an emerging consensus in the literature of the documented benefits of co-planning and teaching that leads to the following conclusions: “1) at all grade levels, students with diverse learning characteristics can be educated effectively in general education environments in which teachers, support personnel, and families collaborate and 2) improvements are evidence in academic and social arenas” (Thousand, Villa, & Nevin, 2006, p. 241).

Walther-Thomas, Bryant, and Land (1996) explored fundamental planning issues that need to be addressed by school systems to facilitate effective co-teaching models. District-level task force committees need to develop long-range inclusive education plans that include: selecting capable and willing participants; providing ongoing professional development; establish balanced classroom rosters; provide weekly scheduled co-planning time; and time to pilot test co-teaching as a service delivery approach before launching a school-wide effort. The researchers further contend that comprehensive co-planning at the district, building, and classroom levels ensures that structurally sound frameworks will be provided to support these programs and helps to ensure that all students receive appropriate instruction that will help them reach their learning goals.

Gately and Gately (2001) found that successful best practices in co-teaching consists of eight components of the co-teaching relationship that contribute to a successful collaborative relationship and learning environment. The eight components are: (a) interpersonal communication, (b) physical arrangement, (c) familiarity with the curriculum, (d) curriculum goals and modifications, (e) instructional planning, (f) instructional presentation, (g) classroom management, and (h) assessment. Through

implementation of these eight components, teachers form a successful collaborative relationship leading to best practices in co-teaching; “the level of success will enhance for all students and adults in the classroom” (p. 47).

Researchers have also examined the nuances of and context through which educators co-teach (Weiss & Lloyd, 2003). The researchers found that the majority of co-teaching consisted of special educators in roles ranging from providing support to the general educator to team teaching. Weiss and Lloyd indicated that the activity of the special education co-taught teacher was defined by factors such as “knowledge of content, attitude of the general educators, and scheduling issues” (p. 27). Teacher characteristics such as their choice in the teaching arrangement and conciliation of roles and responsibilities were also found to be issues that influence the role that each teacher took.

To further illustrate varying co-teaching distinctions, Bouck (2007) investigated the construction of teacher collaboration between general education and special educators. The results of this investigation supported much of the research on successful co-teaching classrooms. This study also extends previous findings by focusing on “different roles available to both teachers, the spaces that needed to be shared and divided, as well as both affordances and constraints the co-teaching service option provided” (p. 49). In addition, the author established that conversations between co-teaching partners are beneficial to addressing issues of roles, providing instruction, and handling classroom management and discipline, as well as issues such as loss of professional autonomy.

Finally, Dieker (2009) identified 6 common characteristics considered essential for creating a positive co-teaching environment. These characteristics include: (a) creating a positive climate of high expectations for academics and behavior for all students, (b) supportive work environment -creating a positive perception of co-teaching by all members, (c) reduced caseload, (d) ongoing administrative support, (e) planning, and (f) use of multiple methods used to evaluate student progress. In addition to the aforementioned studies which examined the intricacies of the inclusive model, numerous researchers have synthesized the available body of literature on co-teaching (Friend & Reisling, 1993; Murawski & Swanson, 2001; Scruggs, Mastropeiri, & McDuffie, 2007; Weiss, 2004; Welch, Bronell, & Sheridan, 1999).

Friend and Reisling (1993) provided an overview of the development of co-teaching. The researchers concluded that: much of the available literature on co-teaching is anecdotal; “teachers reported that co-teaching was effective in positively affecting student achievement and self-concept and that it enabled them to experiment with a wide variety of teaching techniques” (p. 7); and co-teaching holds great promise as one approach for supporting students with disabilities in general education classrooms.

Welch, Bronell, and Sheridan (1999) summarized the conclusions of published articles on team teaching and school-based problem-solving teams. It was reported that most articles are anecdotal reports or technical guides for implementing both models; “research lacks experimental designs and generally report student based outcomes” (p. 36); empirical support for collaborative partnerships in service delivery to students with disabilities such as team teaching choice and problem-solving teams has not kept pace

with their implementation; and with limited knowledge about student outcomes, researchers must attempt to empirically assess the efficacy of collaborative efforts.

Murawski and Swanson (2001) conducted a meta-analysis of 89 studies. Of the 89 studies, 6 provided sufficient quantitative data for an effect size to be calculated ranging from a low (.24) to a high (.95) with an average (.40). The authors conclude that research resulted in moderate effect and “experimental research supporting co-teaching as an appropriate and effective intervention is sparse” (p. 266). Results suggest that future research is needed to substantiate that co-teaching is an effective service delivery choice for disabled students.

Weiss (2004) subsequently updated the work of Weiss and Bingham (2000) and commented that the science of co-teaching to date is very limited. “Studies have examined the implementation of co-teaching as a general service delivery option, but much less attention has been paid scientifically to the character and quality of the co-taught instruction or to the impact of co-teaching on student outcomes” (p. 218). Moreover, the researcher purports that there is little consistent evidence to describe exactly what co-teaching means in terms of instructional actions or teacher responsibilities.

Scruggs, Mastropeiri, and McDuffie (2007) completed a meta-synthesis of 32 qualitative investigations of co-teaching. The authors found that co-teachers typically supported co-teaching, however, a number of crucial needs were identified, including planning time, student skill level, and professional development. “Techniques often recommended for special education teachers, such as peer mediation, strategy instruction, mnemonics, and training of self-advocacy skills, and self-monitoring, were infrequently

observed” (p. 392). The reports included in the meta-synthesis represented a considerable number of teachers and administrators, in many different settings and situations. The researchers were struck by the noteworthy consistency of the findings.

In summation, co-teaching, team teaching, cooperative teaching, and collaborative teaching are used synonymously to describe the process by which a general educator and a special educator teach together in an inclusive classroom (Stuart et al., 2006). The précis of cooperative teaching applied to inclusion commonly finds improved program intensity, continuity, and professional support for disabled students (Cook & Friend, 1995). Numerous researchers such as, Friend and Reisling (1993), Murawski and Swanson (2001), Weiss (2004), Scruggs, Mastropeiri, and McDuffie (2007), and Welch, Bronell, and Sheridan (1999) have synthesized the available body of literature on co-teaching. Many of the researchers concluded that much of the available literature on co-teaching is anecdotal, research lacks experimental design, and with limited knowledge about student outcomes, researchers must attempt to empirically assess the efficacy of collaborative efforts. Moreover, only one (Murawski & Swanson, 2001) of the many researchers who synthesized the available body of literature on co-teaching conducted a meta-analysis which provided effect sizes. The effect sizes ranged from a low (.24) to a high (.95) with an average (.40). The investigators concluded that research resulted in moderate effect and “experimental research supporting co-teaching as an appropriate and effective intervention is sparse” (p. 266). Results suggest that future research is needed to substantiate that co-teaching is an effective service delivery choice for disabled students. However, limited conclusive evidence exists to either confirm or refute whether non-disabled students’ academic achievement is affected by the addition of a special

education co-teacher in the inclusive classroom. The present study looks to address this void in the literature.

Academic Achievement and Inclusion: Empirical Studies on Outcomes for Non-disabled Elementary Students

The debate concerning the effect of inclusion on the academic achievement of non-disabled students continues despite numerous studies and school initiatives resulting from recent education reform policies. The vast majority of studies have focused on factors associated with the academic achievement of disabled students (Fletcher, 2010). Few studies, particularly at the elementary level, have investigated the impact of inclusion on the academic achievement of non-disabled students (Affleck, Madge, Adams, & Lowenbraun, 1988; Daniel & King, 1997; Fletcher, 2010; Huber, Rosenfeld, & Fiorello, 2001; McDonnell, Thorson, Disher, Buckner, Mendel, & Ray, 2003; Saint-Laurent, Dionne, Giasson, Royer, Simard, & Pierard, 1998; Sharpe, York, & Knight, 1994). “While there is mixed evidence on the effects of *inclusion* policies on the students with special needs, research examining potential spillovers of *inclusion* on non-disabled classmates has been scarce” (Fletcher, 2010, p. 69). Furthermore, the outcomes of these studies have produced mixed results. The current study, builds upon the conclusions of the extant body of literature by examining the influence of *co-taught inclusion* on the academic achievement of non-disabled students.

Affleck et al. (1988) investigated how disabled and non-disabled students fared academically, when exposed to the Integrated Classroom Model (ICM). A nonequivalent control group design was employed comparing the academic achievement of 39 randomly selected general education students in grades 3 – 5 on the California

Achievement Test (CAT). Participants were enrolled in two schools in the Issaquah School District, Washington. Integrated classrooms were composed of approximately one third mildly disabled students, and two thirds average to above average general education students (an average of 8 disabled children were included in an average class of 24). Mildly disabled students included those who meet state eligibility criteria for learning disabled, mildly cognitively impaired, and behaviorally disabled.

Data were collected and analyzed on the treatment (enrolled in ICM classrooms) and control (not enrolled in ICM classrooms) groups over a 2 year period. The CAT was group-administered in the fall of year 1 (pre-test) and year 2 (post-test). The total battery percentile scores were converted to NCE scores, and an analysis of variance was used on the pre, post, and gain scores. The results did not indicate any statistically significant differences between the two groups. The researchers concluded that non-disabled students function similarly regardless of whether they are in the ICM or a regular classroom meaning, there were no distinguishable differences in reading, language, or mathematics achievement between those students in an ICM classroom and those in a non-inclusion classroom.

Several issues limit the generalizability of the Affleck et al. (1998) study. First, participants lacked diversity and resided in a middle- to upper-middle class suburban area and therefore, the findings cannot be generalized to urban, rural, or culturally diverse school settings. Second, the authors reported that the school district had a long history of integrative efforts preceding the study and was predisposed to the ideas and philosophy of the ICM before its adoption. Third, replication of this study would be exceedingly difficult based upon a poor description of the experiment and methods used to implement

ICM. Consequently, the results may have skewed the by previous exposure to ICM and not a true measure of program efficacy.

Sharpe, York, and Knight (1994) examined the effects of inclusion on the academic performance of students without disabilities. A post hoc, quasi-experimental, pre-test - post-test study using archival data was conducted comparing the academic performance of 35 students in a general education inclusive classroom with 108 general education peers who were not in an inclusive classroom (n=143). The 5 inclusion students were classified with trainable/educable mental handicaps. The participants, third and fourth grade students, were enrolled in one school in rural [non-farm] Minnesota. The participants were predominantly European American (96%), with a 4% minority population primarily consisting of Native Americans. Approximately 20% of families living in the district were reported to be living below the poverty level as defined by the federal government. The male to female ratio was nearly balanced (49% boys and 51% girls).

Academic performance in reading and mathematics along with effort and behavior were measured. "Four performance measures were employed in this study: (a) the Science Research Associates (SPA) Assessment Survey (SPA, 1975), (b) reading level (as defined by placement in the Houghton Mifflin (1982) reading series, (c) academic performance as indicated by grades on report cards, and (d) general performance as indicated by conduct and effort denotations on report cards" (p. 284). Achievement test scores and report card grades were retrieved 2 years after the inclusion pilot began. The data was analyzed utilizing a one-way analysis of variance (ANOVA) procedures to determine whether mean Normal Curve Equivalent (NCE) scores on pre-

and post- SRA achievement tests differed significantly in the areas of reading, language arts, mathematics, and a composite of all subtest areas. Pearson chi-squares were used to test the independence of the ratings on cross-tabulated tables of differences in pre- and post-basal reading series placement rankings and behavioral ratings on report cards.

The results from the ANOVA indicated that no statistically significant difference between the two groups emerged on any variable measured (reading, $F=.160, p>.05$; spelling, $F=1.024, p>.05$; mathematics, $F=.728, p>.05$). In addition, the results did not indicate a decline in academic or behavioral performance of classmates educated in inclusive classrooms on the report card measures employed.

Sharpe, York, and Knights' (1994) study did not find significant results on academic (group achievement scores, report card ratings) or behavioral (conduct and effort) measures for either group. The researchers maintain that inferences that might be drawn from these results must be mediated by several factors that impose limitations on the study: the study was conducted in one elementary school in a rural context with a relatively small sample size; the five students with disabilities included in general education classrooms presented with significant learning and behavioral challenges; and the results may not be applicable in secondary settings, "where a greater premium is placed on curricular content and academic outcomes rather than more global and social outcomes" (p. 286). The researchers further noted that they were unable to compare their results with previous studies, given the lack of research about the effects of inclusion on the academic and behavioral performance of non-disabled students.

Daniel and King (1997) investigated the effects of elementary students' placement versus non-placement in inclusive classrooms on: (a) parent concerns about their

children's school performance; (b) teacher and parent reported instances of student's problem behaviors; (c) student's academic performance; and (d) student's reported self-esteem. The researchers noted whether placement in different inclusive programs would create differences in measured outcomes. A quasi-experimental design was employed to conduct the study. Participants were third through fifth grade students ($n=207$) from 12 classrooms. Random assignment was not possible as classrooms were established by school district personnel. The sample was comprised of 3 groups: Group 1 students ($n=68$) were from four non-inclusion classrooms; Group 2 students ($n=34$) were from two clustered inclusion classrooms; and Group 3 students ($n=104$) were from six inclusion classrooms.

Instrumentation included the Stanford Achievement Test (SAT), Child Behavior Checklist (CBCL), Parent Concerns Questionnaire, and Self-esteem Index (SEI). An AVOVA was computed to investigate whether students differed in their initial achievement levels. To ensure that appropriate comparisons were made, the researchers made comparisons at each grade level for teacher and student generated data.

Discriminant analysis results indicated that "a) parents of students in the inclusion classes expressed a higher degree of concern for their children's school programs; b) teachers and parents of the students in the inclusion classes reported more instances of behavioral problems; c) students in inclusion classes were more likely to experience gains in reading scores with no noteworthy differences for mathematics, language, and spelling; and d) students in inclusion classes reported lower levels of self-esteem" (p. 67). The discriminant analysis of data (SEI, SAT, & CBCL – teacher response) indicated: Grade 3 effect size of 34.6% (Wilks's Lambda $\Lambda=.65$), $p < .01$, indicating a statistically

significant difference in the performance of the non-inclusion and inclusion students; fourth grade effect size of 31.2% ($\Lambda=.69$), $p < .10$, indicating a statistically significant difference in the performance of the non-inclusion and inclusion students; and fifth grade effect size of 37% ($\Lambda=.63$), $p < .01$, indicating a statistically significant difference in the performance of the inclusion and clustered students (a comparison of two different inclusion models). The analyses of data resulted in a significant difference in performance of the students in inclusion classes and non-inclusion classes. The researchers reported that the results of the study were mixed and somewhat difficult to decipher as, the Grade 3 inclusion students made gains in reading, experienced more behavioral problems and reported lower levels of self-esteem when compared to the non-inclusive students; fourth grade non-inclusion students made gains in mathematics and reported higher self-esteem scores when compared to the non-inclusive students; and fifth grade yielded mixed results. The researchers concluded that no consistent pattern of academic performance emerged and the higher incidence of behavior problems in the inclusive classrooms may diminish time on instruction as a result of time devoted to handling these problems. Consequently, the behavioral issues brought into the classroom by special needs students may have a negative effect on their classmates.

The researchers reported an insignificant amount of demographic (e.g., gender, socioeconomic status) and variable (degree and magnitude of disability, ratio of non-disabled to disabled students enrolled in inclusion classes) data was provided about participants which limits opportunity to analyze the variance between or within groups. Also, the lack of experimental control such as, the inability to randomize assignment may have influenced the findings. Generally speaking, the school personnel who placed

students may have intentionally or unintentionally placed students together or with specific teachers yielding questionable representative sampling data.

Saint-Laurent et al. (1998) examined the effects of an in-class service model on the academic achievement of students with and without disabilities. The participants included a total of 606 White, French speaking, thirdgrade students from 26 schools located in the two urban areas of the province of Quebec (Montreal and Quebec City). The treatment group consisted of 288 students (145 girls and 143 boys); 79 met the at-risk criteria and 34 students were identified as special education students by the school. The treatment condition consisted of all students receiving instruction and academic support through the PIER model in the general education classroom only. Through the PIER model the special education teachers spent 3 hours per week with the class and collaborated for 60 minutes per week with the general education teacher. In contrast the comparison condition classrooms used traditional general education teaching methods, characterized by instructing the entire class with minimal cooperation between the special and general education teachers.

Student performance, the effect of the program, was measured by two multivariate analyses of covariance. “A 2 (Group) x 2 (Student Type) MANCOVA performed on these scores revealed a significant effect for Group x Student Type interaction, [$F(3, 511) = 7.03$, p [is less than] .001, Wilks's lambda = .96]; Univariate tests showed significant differences in reading, [$F(1, 513) = 4.96$, p [is less than] .05], writing, [$F(1, 513) = 5.56$, p [is less than] .05], and mathematics [$F(1, 513) = 7.24$, p [is less than] .01]” (p. 248). Effect sizes were reported as: reading (-0.04), writing (0.50), and mathematics (0.13). The effect size for writing is considered moderate however, the

effect size for mathematics is considered low and should be taken into account when interpreting the results of this study.

Saint-Laurent et al. (1998) reported the following results to their study: (a) the treatment program benefits both at-risk and general education students in at least one academic area; (b) the PIER model was at least as effective as activities conducted in the comparison classes for reading and mathematics, and it produced higher writing scores for at-risk students; (c) general education students were not held back by the presence of at-risk students who were present in the classroom; and (d) general education students benefited from the additional interventions that form part of the PIER model in reading and mathematics.

Despite the positive results reported by the researchers, several methodological issues were inherent in this study. First, as reported, random assignment to the group was made for special and general education teacher dyads, but not for students. Second, it was not possible to control for all the experimental variables in the classrooms. Third, given that the teachers were volunteers, they were not necessarily representative of the population of teachers. Finally, the degree of difficulty of the test was unknown to the researchers other than the test was sanctioned by the provincial Department of Education, Quebec, Canada. Also, the researchers neglected to report the design of the experiment in their article. Therefore, interpretation of the results is limited because it is difficult to identify the parameters of the design. The aforementioned methodological issues coupled with the researcher's lack of knowledge of the psychometric properties of the achievement tests can potentially limit the integrity and generalizability of the study.

Huber, Rosenfeld, and Fiorello (2001) studied the differential impact of inclusion and inclusive practices on high, average, and low achieving general students.

Achievement scores on the Metropolitan Achievement Test (MAC; 6th ed.) for 477 general education students from grades 1 through 5 were sampled over a 3 year period. The participants were randomly selected from 3 Eastern Pennsylvania elementary schools and were from working-class families with an ethnic distribution of 72% White, 27% African American, and 1% Asian.

Data were analyzed using, a 2 (year) x 3 (skill level) ANOVA, balanced factorial design, with repeated measures on the year factor was performed; Tukey's test was employed to identify significant differences between group means. Huber et al. (2001) reported that inclusive school practices were found to have a differential effect in that, low achieving general education students appeared to benefit academically, while higher achieving students were adversely impacted. General education students enrolled in the inclusion classes were not significantly affected in reading however, the effect was mixed in math. The researchers concluded that, "consistent with previous research, the number of students with disabilities within general classes did not appear to have a significant effect on general education students' reading achievement and in math, there was a significant effect, but the pattern of results was unclear." (p. 503).

Results further indicated: (a) the student skill factor had a statistically significant effect on incremental change in general education students' reading scores, $F(2,498) = 12.86, p < .001$; (b) the student skill factor had a statistically significant effect on math change scores, $F(2,546) = 26.85, p < .001$; (c) no significant differences among group means for general education students in classrooms with different numbers of included

students with disabilities, $F(7,791) = 0.87, p = .53$ and; (d) significant differences among the group means of children educated with different numbers of included students with disabilities, $F(7,794) = 4.82, p < .001$. The analysis of the data suggests that inclusion and inclusive practices may lead to different rates of achievement for general education students.

Huber et al. (2001) conducted a well designed study with random assignment, a robust sample, and experimental control. Despite the high-quality design and promising results several factors can potentially limit how the results can be generalized. First, the participants were not economically diverse (predominantly working class) or ethnically represented (lack of Hispanic participants). Second, the majority of included special education students were classified learning disabled. These factors can potentially skew the results as the sample was not truly representative of the population.

McDonnell et al. (2003) completed an exploratory study which addressed the impact of inclusive educational programs on the achievement of students with developmental disabilities and their non-disabled peers. The researchers utilized a quasi-experimental, pre-test – post-test design, which involved 14 students with developmental disabilities in inclusive classrooms (ages 6-12; I.Q. ranged from Not Testable to 78 with an average of 54.6 based on standard I.Q. tests), their 324 typical classmates, and 221 typical students in non-inclusive elementary classes. Participants were enrolled in five different elementary schools, located in four different districts. The districts were a combination of rural, suburban and urban. Students were enrolled in first through fifth grade. The number of students participating in inclusion classes varied from 1 to 7.

Student performance was measured using the Utah Core Assessment (UCA), a criterion referenced achievement test and the Scales of Independent Behavior – Revised (SIB-R) (used with developmentally delayed students). Data were analyzed as follows: pre-test – post-test performance changes on the SIB-R was assessed using a Wilcoxon Signed Rank Test and non-disabled students were compared in inclusive and non-inclusive classes on the UCA using a one-way ANOVA.

The results of a one way analysis of variance indicated no statistically significant difference in academic performance was achieved with respect to non-disabled students enrolled in inclusion classes and their non-disabled peers enrolled in non-inclusive classes (reading/language arts, $F=.02$, $p=.87$, $df=1,543$; mathematics $F=.39$, $p=.52$, $df=1,543$). “The results suggest that the presence of students with developmental disabilities did not negatively impact the educational achievement of students without disabilities”(p. 235). Furthermore, the results of the two-tailed Wilcoxon Signed Rank Test on pre- and post-test measures were found to be statistically significant ($Z=3.18$, $p < .001$), indicating that students with developmental disabilities made gains in adaptive behavior. The researchers concluded that their results were consistent with the results found by Sharpe et al. (1994) suggesting that “the concerns that some authors have expressed about the negative impact of inclusion on educational achievement of students without disabilities may be unwarranted” (p. 235).

McDonnell et al. (2003) also present with methodological limitations. The quasi-experimental design may limit the cause and effect conclusions drawn about the impact that inclusion on the achievement of students in the study. In addition, the relatively small

number of students can potentially limit the amount of generalizations that may be made on the effects of inclusion.

Fletcher (2010) examined the spillover effects of inclusion of classmates with emotional problems on test scores in early elementary education. The researcher conducted a cross-sectional study using a nationally representative longitudinal survey of kindergarten students. The Early Childhood Longitudinal Study, Kindergarten Cohort (ECLS-K) is a nationally representative sample of kindergartners, their teachers, and schools. The participants ($n = 11,373$) were from both public and private schools and attended both full-day and part-day kindergarten programs and came from diverse socioeconomic and racial/ethnic backgrounds. This study sought to mitigate the bias of the sorting of students by controlling for student-level fixed effects and in so doing identify spillover effects using within student differences in exposure to classmates with emotional problems between kindergarten and first grade.

An Ordinary Least Squares Regression was completed to examine the relationship between mathematics and reading tests and the treatment of having a classmate with a serious emotional problem. Cross-sectional results indicate that having a classmate with an emotional problem reduces reading and math scores at the end of kindergarten and first grade by over 10% of a standard deviation, which is reported as one-third to one-half of the minority test score gap. “The magnitude of this effect is approximately 40% of the adjusted Hispanic–White average difference in test scores and approximately 25% of the size of the adjusted Black–White test score gap” (p. 77). The researchers further reported that for mathematics scores, Black and Hispanic students seem to be most affected by exposure to classmates with emotional problems (12% and 9% of a standard deviation,

respectively). For reading achievement, White and Black students were reported to face similar decreases with exposure to classmates with emotional problems (3% of a standard deviation), however, the effects on Hispanic students were nearly 10% of a standard deviation. The results were also very comparable by gender, education level of mothers, and marital status of mothers. Finally, females were more affected than males (4% vs. 2%), and students with more highly educated mothers are also more affected (4.5% vs. 1%). Additionally the results for male math regression scores = -0.066 at 1% and female math regression scores = -0.053 at 5%; male reading regression scores = -0.013 and female math regression scores = -0.043. The results suggest that in both reading and mathematics, exposure to girls in the classroom increases achievement; a 10 percent increase in the proportion of classmates who are girls increases achievement by 1 percent of a standard deviation.

According to Fletcher (2010), the consistent result for mathematics and reading test scores indicate that students with classmates who have a serious emotional problem score significantly lower than other students, though the results for reading are often not statistically significant. To that end, the author contends that the results suggest that the policy of full inclusion of students with all types of disabilities into regular education classroom may need to be re-evaluated. In particular, the benefits and costs both of the disabled children and the non-disabled children should be considered.

Fletcher (2010) indicated that “the study was limited by the fact that no information was provided in the data describing the algorithms used by schools to match students with classmates and purposeful matching of students could introduce bias in

estimating spillover effects” (p. 81). In addition, this study was limited by the inability to control for teacher sorting across classrooms within schools.

To summarize, Fletcher (2010) put forward “while there is mixed evidence on the effects of *inclusion* policies on the students with special needs, research examining potential spillovers of *inclusion* on non-disabled classmates has been scarce” (p. 69). The body of empirical research that does exist concerning the impact of inclusion on non-disabled student’s academic achievement has resulted in mixed outcomes (Daniel & King, 1997; Huber, Rosenfeld, & Fiorello, 2001; Hunt, Staub, Alwell, & Goetz, 1994; Kalambouka et al., 2007; Manset & Semmel, 1997; Saint-Laurent et al., 2002; Sharpe, York & Knight, 1994; Staub & Peck, 1995). Some researchers claim that inclusion does not impact the academic achievement of non-disabled students; others assert that non-disabled students are negatively affected; while others argue that inclusion improves non-disabled academic achievement. The conclusions drawn from research depends upon the population being served (e.g., type and level of disability) and the interrelated conditions in the particular study (e.g., model of inclusion, years of teacher experience, class size). The current study, builds upon the conclusions of the extant body of literature by examining the influence of *co-taught inclusion* on the academic achievement of non-disabled students in mathematics at the elementary level.

Summary

There is a considerable body of research on the academic, social and emotional benefits of inclusion for non-disabled students (Rea et al., 2002; Sharpe, York, & Knight, 1994; Waldron, 1997; Walther-Thomas, Bryant & Land, 1996). The extant body of literature on the impact of inclusion on non-disabled students typically focuses on the

affective gains (Logan et al., 1995; Peltier, 1997). However, empirical research concerning the impact of inclusion on non-disabled student's academic achievement has resulted in mixed outcomes (Fletcher, 2010; Staub & Peck, 1995). The literature is also unclear on if and how placement in a co-taught inclusive classroom influences the academic achievement of non-disabled students in mathematics at the elementary level. The present study signifies a step toward examining a very complex set of circumstances attempting to determine academic differences of non-disabled students based on instructional and policy changes that have been implemented in the classroom. Chapter III presents a detailed review of the methodology of this study.

Chapter III

METHODOLOGY

The purpose of this non-experimental quantitative study is to determine the extent to which placement in a co-taught inclusive setting correlates with non-disabled students' academic achievement. Specifically, an analysis of the influence of the independent/grouping variable of co-taught inclusion (general and special education teacher and general and special education students) on the dependent variable of academic performance as measured by Grade 3 non-disabled students full scale and cluster scores in mathematics on the New Jersey Assessment of Skills and Knowledge (NJ ASK).

Research Design

An ex post facto or causal-comparative non-experimental quantitative research design was utilized to gather and analyze data in this study. This method of research was employed given that the researcher did not have direct control of independent/grouping variable as the manifestation had already occurred. In other words, both the effect and the alleged cause had already occurred and needed to be studied in retrospect. Therefore, through the use of this method the researcher was able to test hypotheses concerning the influence of placement (independent/grouping variable) on non-disabled students' academic achievement (dependent variable).

Research Questions

Research Question 1: What is the influence of placement in the co-taught inclusive setting on the performance of Grade 3 non-disabled students in the area of mathematics as measured by the NJ ASK?

Sub-question a: What is the difference in Number and Numerical Operations cluster scores as measured by the New Jersey ASK 3 for non-disabled students assigned to co-taught inclusive mathematics class verses non-inclusive class?

Sub-question b: What is the difference in Geometry and Measurement cluster scores as measured by the New Jersey ASK 3 for non-disabled students assigned to co-taught inclusive mathematics class verses non-inclusive class?

Sub-question c: What is the difference in Patterns and Algebra cluster scores as measured by the New Jersey ASK 3 for non-disabled students assigned to co-taught inclusive mathematics class verses non-inclusive class?

Sub-question d: What is the difference in Data Analysis, Probability and Discrete Mathematics cluster scores as measured by the New Jersey ASK 3 for non-disabled students assigned to co-taught inclusive mathematics class verses non-inclusive class?

Sub-question e: What is the difference in Problem Solving cluster scores as measured by the New Jersey ASK 3 for non-disabled students assigned to co-taught inclusive mathematics class verses non-inclusive class?

Hypotheses

H_0^1 : There is no significant difference in the performance scores in mathematics on the New Jersey ASK 3 for non-disabled students assigned to co-taught inclusive mathematics class verses non-inclusive mathematics class.

Population

The participants in this study were selected from an upper middle class suburban elementary school district (P-6), located in northern New Jersey. The Township is 10.58 square miles with a population of approximately 60,000. The Title II district is comprised of two schools with approximately 750 students enrolled in preschool through the sixth grade. The elementary school of the participants in this study enrolled 431 children, Grades P through 3, with general education class sizes of about 20 students. The ethnic composition is comprised of Caucasian (91%), Hispanic (5.2%), African American (0.8%), and Asian (3%). Low income families represent only 0.8% of the district. The District Factor Group (DFG) is reported as GH (DFGs are labeled from A [lowest] to J [highest] and are an indicator of the socioeconomic status of citizens in each district). According to the State of New Jersey School Report Card, the district is currently making adequate yearly progress (AYP) and not classified as a school in need of improvement. The participants in this study consisted of 99 Grade 3 students, ranging in age from 8 to 9.

Sample Size

The sample of this study consisted of 99 non-disabled students in the Grade 3. Table 1 presents the breakdown of non-disabled students by grade level and placement. Table 1

Sample Size

| Participants | | | |
|--------------|-----------|---------------|----|
| | Placement | | |
| Grade | Inclusion | Non-Inclusion | N |
| 3 | 15 | 84 | 99 |

Procedures

A written proposal was presented to the district superintendent prior to the commencement of this study. A discussion ensued and permission was granted (see Appendix A). Participant groups were subsequently identified utilizing Genesis, the district student management software package.

Participants who met the following criteria were chosen to participate in this study: (a) each student in the sample will have valid overall and cluster scores in mathematics on the NJ PASS; (b) each student in the sample will have valid overall and cluster scores in mathematics on the NJ ASK 3; (c) each student in the sample completed both second and third grade in the same district and school; and (d) each student in the sample was no less than 8 years of age and no more than 9 years of age by June 30, 2010.

Participants were assigned to classrooms, that is, co-taught inclusive and non-inclusive, prior to the onset of this investigation by school district administration. While the researcher of this study was unable to control for class placement, similarity of cohorts can be assumed based the criteria used to place students in classes. More specifically, second grade standardized test scores on the New Jersey Proficiency Assessment of State Standards (NJ PASS) in mathematics and language arts were used as a baseline to establish a normal distribution of student ability levels in each classroom (i.e., balanced for high, average, and low achieving students).

The NJPASS is a criterion-referenced standards-based test with a multiple test item format; multiple choice and open-ended writing tasks, and revise and edit tasks. Student mastery toward meeting the New Jersey Content Standards for Mathematics Skills form the framework for measuring student progress in meeting the New Jersey

Core Curriculum Content Standards (NJCCCS) on: Number Sense, Operations, and Properties; Measurement; Spatial Sense and Geometry; Data Analysis, Probability, and Discrete Mathematics; patterns and Algebra. Open-ended questions require students to demonstrate their knowledge of grade-level material. Students are asked to show their work or explain their reasoning and communicate mathematically by creating graphs or showing multi-step solutions. For the purpose of this study, mathematics scores (May, 2009) were utilized as a measure of pre-achievement and an independent samples *t* test was conducted to account for the variability associated with the differences between the sample means of the comparison groups.

Since this study was conducted post hoc, archival data were collected from student files. Achievement test scores were retrieved at the conclusion of the 2009-2010 school year utilizing Genesis, the district student management software package. Non-disabled students were coded by grade level based on placement in comparison group 1 (non-disabled students assigned to co-taught inclusive placements) or comparison group 2 (non-disabled students assigned to non-inclusive placements).

Students placed in the co-taught inclusive classroom were instructed by way of the cooperative team teaching model (Villa, Thousand, & Nevin, 2008). Through this model, co-teachers mutually planned team-taught, assessed, and shared leadership and responsibility for all of the students in the classroom. All general and special education teachers participated in common planning time during one period each week (40 minutes). Co-teaching pairs met for one additional common planning period each week (40 minutes).

All students were instructed via the district approved mathematics program, Everyday Mathematics (EDM), 3rd edition (updated from the 2nd edition in 2008). Published by McGraw-Hill/ SRA Wright Group Company, the University of Chicago School Mathematics Project, Everyday Mathematics was introduced 20 years ago and is utilized by nearly 3 million students in the United States. EDM is a core curriculum, covering numeration and order, operations, functions and sequences, data and chance, algebra, geometry and spatial sense, measures and measurement, reference frames, and patterns for students in kindergarten through the 6th grade. The distinguishing features of EDM are its focus on real-life problem solving, student communication of mathematical thinking, and appropriate use of technology (What Works Clearing House, 2007). The EDM program was implemented in the district 4 years ago. All teachers in this study participated in the same in-district and out-of-district professional development training [PRISM] provided at a local university.

All students received mathematics instruction for a total of 400 minutes per week; 80 minutes per day, 5 days of week. Additionally, all students are exposed to the same curriculum (see Figure 2 for the mathematics curriculum map). The curriculum correlates with the New Jersey Core Curriculum Content Standards and is updated in 5 years cycles. The curriculum is currently in the third year of the cycle. Finally, all students were expected to share common classroom similarities specifically, the curriculum, instructional delivery pace (per curriculum map), and pedagogical materials.

In May of 2010, students completed the New Jersey Assessment of Skills and Knowledge (NJ ASK). Historically (past 4 years), student progress [in district] as

measured by Grade 3 NJ ASK scores has been proportionally similar across teachers when comparing cohorts of students.

Variables

This study was designed to determine the extent to which placement in a co-taught inclusive setting correlates with non-disabled students' academic achievement. The influence of the independent/grouping variable of co-taught inclusion (general and special education teacher and general and special education students) on the dependent variable of academic performance as measured by Grade 3 non-disabled students overall and cluster mathematics scores on the New Jersey Assessment of Skills and Knowledge (NJ ASK) were examined.

Instrumentation

The New Jersey Assessment of Skills and Knowledge (NJ ASK) is designed to measure the extent to which all students at the elementary-, middle-, and secondary-school levels have attained New Jersey's Core Curriculum Content Standards (CCCS) in Language Arts Literacy (LAL), mathematics and science (excluded in grade 3). For the purpose of this study, full scale and cluster scores in mathematics, that is, Number and Numerical Operations, Geometry and Measurement, Patterns and Algebra, Data Analysis, Probability and Discrete Mathematics and Problem Solving, will be utilized for Grade 3 students. The NJ ASK 3 reports both raw and scale scores. "A raw score is the total number of points a student earns on a test. "A scale score is simply a conversion of that raw score, using a predetermined mathematical algorithm, to permit legitimate and meaningful comparisons over time and across grades and content areas"(NJ ASK Score Interpretation Manual, 2010, p. 20). The total scores in Mathematics are reported as scale

scores with a range from 100-199 (Partially Proficient), 200-249 (Proficient), and 250-300 (Advanced Proficient).

The scores of students who are included in the Partially Proficient level are considered to be below the state minimum of proficiency and those students may be most in need of instructional support. The results are to be used by schools and districts to identify strengths and weaknesses in their educational programs. It is anticipated that this process will lead to improved instruction and better alignment with the CCCS. The results may also be used, along with other indicators of student progress, to identify those students who may need instructional support in any of the content areas. This support, which could be in the form of individual or programmatic intervention, would be a means to address any identified knowledge or skill gaps (NJDOE, 2008, p.3)

According to the New Jersey Ask Score Interpretation Manual (2010):

Partially Proficient

Students performing at the Partially Proficient level have limited recall, recognition and application of basic facts and informational concepts.

- Partially Proficient students perform simple routine procedures such as computing a sum, difference or product, and can use a specified procedure with some accuracy. These students have limited ability to demonstrate number sense by using place value concepts and fractions. Partially proficient students may have difficulty with determining the appropriate operation for a given situation and with estimating their results.

- Partially Proficient students can apply basic concepts of geometry and measurement. These students have a basic working knowledge of spatial sense, geometric properties and geometric relationships. Partially proficient students can sometimes use appropriate measurement tools accurately.
- Partially Proficient students have a basic understanding of how quantities are related to one another and how algebra can be used to concisely represent and analyze those relationships. These students can recognize, describe, extend, and create simple patterns as well as solve simple problems involving functions.
- Partially Proficient students have a basic understanding of how to apply the concepts and methods of data analysis, probability, and discrete mathematics. These students are able to read a graph, table, or chart.
- Partially Proficient students can identify and use basic mathematical terms as well as apply some reasoning methods to solve simple problems.

Proficient

Students performing at the proficient level demonstrate recall, recognition and application of facts and informational concepts.

- Proficient students perform routine procedures such as computing a sum, difference or product, and can use a specified procedure with accuracy. These students are able to demonstrate number sense by using place value concepts and fractions. Proficient students determine the appropriate operation for a given situation and can use estimation appropriately.

- Proficient students understand and apply concepts of geometry and measurement. These students can demonstrate a working knowledge of spatial sense, geometric properties and geometric relationships. Proficient students can use appropriate measurement tools accurately.
- Proficient students demonstrate an understanding of how quantities are related to one another and how algebra can be used to concisely represent and analyze those relationships. These students can recognize, describe, extend, and create patterns as well as solve problems involving functions.
- Proficient students understand and apply the concepts and methods of data analysis, probability, and discrete mathematics. These students are able to read, interpret, and represent information in a graph, table, or chart.
- Proficient students use various forms of representation to illustrate steps to a solution and effectively communicate a variety of reasoning methods to solve multi-step problems. Proficient students can explain steps and procedures for finding solutions, as well as check the reasonableness of their results.

Advanced Proficient

Students performing at the Advanced Proficient level demonstrate the qualities outlined for Proficient performance. In addition, these students determine strategies and procedures to solve routine and non-routine problems. An Advanced Proficient student draws appropriate inferences and provides explanations that are consistently clear and thorough. These students consistently demonstrate the ability to abstract relevant information, use multiple strategies and/or reasoning methods, and use various forms of

representations to solve challenging problems. These students demonstrate an understanding of the reasonableness of their answers. (pp. D8-D9)

NJ ASK Reliability

The NJ ASK assessments were designed under the supposition of Classical Test Theory (CTT). The CTT approach builds on the notion of an ideal, error-free or true measurement score and is represented as follows: $X = T + E$, where X = the total score/observed score obtained T = the true score and E = the error component (NJDOE, 2008). According to De Klerk (2008):

Classical Test Theory assumes that each observed score (X) contains a True component (T) and an Error component (E). When measuring a construct, unsystematic errors occur. These unsystematic errors could be anything, for instance distractions from outside the testing situation, physical wellbeing of the candidate or good/bad luck. You can think of many different influences that can affect a candidate at the specific moment of taking the test.

Sometimes these influences have a positive effect on the test result; other times they have a negative influence. In other words they cause a band (range) of error around the True score. (p. 1)

Reliability of test scores is measured by the stability or consistency of scores over replications (Gay, Mills, & Airasian, 2009). The measure of consistency of results across items on the same test is known as internal consistency. The most common internal consistency measure is the alpha coefficient, also called Cronbach's Alpha (Gay, Mills & Airasian, 2009).

The technique utilized for estimating reliability (from a single test administration) for the NJ ASK was Cronbach's coefficient alpha. Cronbach's alpha estimates internal consistency reliability by determining how all items on a test relate to all other test items and to the total test (Gay, Mills, & Airasian, 2009). Coefficient Alpha scores above .90 are considered "highly reliable," between .80 and .89 are considered to have "good reliability," between .70 and .79 are considered to have "fair reliability," between .60 and .69 are considered to have "marginal reliability," and coefficients under .60 are considered unacceptable reliability (Reinard, 2006).

According to the *Grades 3 and 4 New Jersey Assessment of Skills and Knowledge Technical Report* (NJDOE, 2008), the coefficient alpha score for Grade 3 mathematics were reported as: overall [content] mathematics .84; Number and Numerical Operations .74; Geometry and Measurement .48; Patterns and Algebra .45; Data Analysis, Probability and Discrete Mathematics .50; and Problem Solving .71. The New Jersey Department of Education (2008) reports that it "is required by federal law to ensure that the instruments it uses to measure student achievement for school accountability provide reliable results" (p.116). However, when analyzing the content and cluster scores, it is apparent that coefficient alpha scores tend to vary from measures of good reliability ($\alpha = .84$; mathematics content) to measures of unacceptable reliability ($\alpha = .45$; Patterns and Algebra). Despite this phenomenon, the reliability of the test scores is based on the statewide population and may not be representative of GH DFG students. Consequently, data used in this study may be different.

NJ ASK Validity

The NJ ASK is a comprehensive set of assessments that measure student achievement of the Core Curriculum Content Standards. The validity of the NJ ASK scores is based on the alignment of the NJ ASK assessments to the Core Curriculum Content Standards and the knowledge and skills expected of third through fourth grade students (NJDOE, 2008). The Technical Report cited the Standards for Educational and Psychological Testing (American Educational Research Association, American Psychological Association, & National Council on Measurement in Education, 1999, p. 11-12) as possible sources of validity evidence. Particularly, “validity evidence based on: test content, internal structure of the test, relations to other variables, and consequences of testing” (p. 66). For an assessment like the NJ ASK which is intended to measure students’ performance in relation to the Core Curriculum Content Standards, content validity evidence is primary. Content validity is the most relevant and important source of evidence. (NJDOE, 2008)

The State of New Jersey addressed the issue of content validity by examining the adequate representation of the content domain the test was intended to measure. Specifically,

adequacy of the content representation of the NJ ASK is critically important because the tests must provide an indication of student progress toward achieving the knowledge and skills identified in the CCCS, and the tests must fulfill the requirements under NCLB. Adequate representation of the content domains defined in the CCCS is assured through use of a test blueprint and a responsible test construction process. New Jersey performance standards, as

well as the CCCS, are taken into consideration in the writing of multiple-choice and constructed response items and constructed-response rubric development. Each test must align with and proportionally represent the sub domains of the test blueprint. (NJDOE, 2009, p. 143)

In addition to providing the aforementioned evidence involving the degree to which the content of the test matches a content domain associated with the construct (content validity), the Technical Manual also provides evidence involving the empirical and theoretical support for the interpretation of the construct (construct validity).

According to the 2009 version of the NJ ASK Technical Manual, construct validity was measured by studying the pattern of relationships among the content areas and testing methods. One method for studying patterns of relationships to provide evidence supporting the inferences made from test scores is the multi-trait matrix which reports on Pearson correlation coefficients among test content domains and clusters by grade level. The correlations between clusters within a content area were reported to be higher than the correlations between clusters across the content areas.

Data Collection

According to the NJ ASK Technical Report (NJDOE, 2008), “testing is conducted in the spring of each year to allow school staff and students the greatest opportunity to achieve the goal of Proficiency” (p. 3). Great care was taken by district personnel to assure standard administration of the NJ ASK. Protocols outlined in the *New Jersey Assessment of Skills & Knowledge Spring 2010 Test Coordinator Manual* were strictly adhered to. All NJ ASK score reports were coded to guarantee confidentiality. The 2010 NJ ASK test scores were used in this study.

Data Analysis

An analysis of the data was conducted to determine the influence of student placement (co-taught inclusive verses non-inclusive classroom) on academic achievement (overall and mathematics cluster scores of Grade 3 non-disabled students on the NJ ASK). Achievement data was analyzed through the use of SPSS version 16.

Pre-achievement for the treatment and control groups was measured utilizing the NJPASS test. As previously discussed, the NJPASS test was administered in May of 2009 and utilized by district administration as a baseline to establish a normal distribution of student ability levels in each classroom (i.e., balanced for high, average, and low achieving students). An independent samples t test was performed to account for the variability associated with the differences between the sample means of the comparison groups. The independent samples t test is comprised of two main parts; Levene's test for the assumption for equal variances, and the t test for Equality of Means (Leech, Barrett, & Morgan, 2008). A critical assumption of the t test is that the variances (standard deviation squared) of the two groups (inclusion and non-inclusion) are approximately equal. Levene's test provides both F statistics and Significance levels (p). The results of the independent samples t test will be discussed in Chapter IV in an attempt to demonstrate that student achievement was similar before the participants were placed in Grade 3.

Measures of central tendency were also calculated and analyzed; the average performance [mean] of each placement group on the NJ ASK mathematics scores and the spread of NJ ASK scores around the mean [standard deviation]. Inferential measures were also calculated and analyzed: t tests were used to determine whether the scores of

the respective groups were significantly different from one another. An independent samples *t* test was also performed for NJ ASK 3 full scale and cluster scores in mathematics, that is, Number and Numerical Operations, Geometry and Measurement, Patterns and Algebra, Data Analysis, Probability and Discrete Mathematics and Problem Solving, to account for the variability associated with the differences between the sample means of the comparison groups (i.e., inclusion and non-inclusion). The hypotheses of this study were tested at the .05 probability level or higher.

Internal and External Validity

Gay, Mills, and Airasian (2009) contend that an experiment is valid if results obtained are due only to the manipulated independent variable and if they are generalizable to individuals or contexts beyond the experimental setting. “Providing information about sources of invalidity and rival explanations (a) allows readers to better contextualize the underlying findings, (b) promotes external replications, (c) provides a direction for future research, and (d) advances the conducting of validity meta analyses and thematic effect sizes” (Onwuegbuzie, 2003, p. 87). For the purpose of this study, internal validity is defined as “the degree to which observed differences on the dependent variable are a direct result of manipulation of the independent variable, not some other variable” (Gay, Mills, & Airasian, 2009, p. 242). External validity is defined as the degree to which the study results are generalizable, or applicable, to groups and environments outside the experimental setting”(p. 242).

The seminal work of Campbell and Stanley (1963) provides one of the most authoritative sources on experimental design and threats to experimental validity. Campbell and Stanley identified eight threats to internal validity, that is, history,

maturation, testing, instrumentation, statistical regression, differential selection of participants, mortality, and interaction effects. Building on the work of Campbell and Stanley (1963), Smith and Glass (1987) refined and expanded threats to external validity and classified these threats into three categories: population validity, ecological validity, and external validity of operations (Onwuegbuzie, 2003). To improve the quality of this dissertation, the writer has opted to include the ensuing discussion of the potential rival hypotheses in this investigation based on the frameworks put forth by Campbell and Stanley and Smith and Glass.

Research Design/ Data Collection and Threats to Internal Validity

History

This threat to internal validity refers to any event or condition (unrelated to the treatment) occurring during the study that may affect the dependent variable (Campbell & Stanley, 1963). After a review of district critical incident records for the 2009-2010 school year, there were no reported bomb scares, intruders, medical conditions (e.g., H1N1, Merca Staph Ylococcal Infections, West Nile Virus), unplanned school evacuations, or fires in the building where participants were housed. Additionally, each teacher who began the study also completed the study. As a result of the aforementioned factors, history is not considered a threat to the internal validity of this study.

Maturation

Maturation refers to the changes that naturally occur within a study participant (e.g., physical, intellectual, emotional) due to the passage of time (Campbell & Stanley, 1963). To control for maturation, participants in the sample were no less than 8 years of age and no more than 9 years of age by June 30, 2010. This represents the naturally

occurring age for a Grade 3 student and controls for participants who may have been retained and exposed to the curriculum for a second time. A review of referrals to the school principal, social worker, and psychologist was conducted to account for emotional factors that can be incorrectly attributed to the independent variable. The review did not yield any reported: deaths in the immediate family, terminal illness of participants or family members, or parental divorce or catastrophic events for the participants involved in this study. As a result of the aforementioned factors, maturation is not considered a threat to the internal validity of this study.

Testing

Testing refers to the threat of changes that may occur in participant's scores on the post-test that results from having taken the pre-test (Campbell & Stanley, 1963). "Testing is more likely to prevail when (a) cognitive measures are utilized that involve the recall of factual information and (b) the time between administration is short" (Onwuegbuzie, 2003, p. 74). Since the NJ PASS and NJ ASK are based on the same testing format, taking the pre-achievement measure may improve participant's scores on the post-achievement measure, regardless of whether they received any treatment or instruction in between. Onwuegbuzie (2003) contends that "when cognitive tests are administered, a pre-intervention measure may lead to increased scores on the post-intervention measure because the participants are more familiar with the testing format and condition, have developed a strategy for increasing performance, are less anxious about the test on the second occasion, or can remember some of their prior responses and thus make subsequent adjustments" (pp. 74-75). Consequently, testing can be viewed as a possible threat to the internal validity of this study.

Instrumentation

The instrumentation threat to internal validity refers to the unreliability, or lack the appropriate level of consistency, in measuring instruments that may yield an invalid assessment of performance (Campbell & Stanley, 1963). As previously mentioned, the NJ ASK assessments were designed under the supposition of Classical Test Theory (CTT). Reliability of test scores is measured by the stability or consistency of scores over replications (Gay, Mills & Airasian, 2009). The measure of consistency of results across items on the same test is known as internal consistency. The most common internal consistency measure is the alpha coefficient, also called Cronbach's Alpha (Gay, Mills & Airasian, 2009). The technique utilized for estimating reliability (from a single test administration) for the NJ ASK was Cronbach's coefficient alpha. Cronbach's alpha estimates internal consistency reliability by determining how all items on a test relate to all other test items and to the total test (Gay, Mills & Airasian, 2009). The New Jersey Department of Education reports that it "is required by federal law to ensure that the instruments it uses to measure student achievement for school accountability provide reliable results" (NJDOE, 2008, p.116). Coefficient Alpha scores above .90 are considered highly reliable, between .80 and .89 are considered to have good reliability, between .70 and .79 are considered to have fair reliability, between .60 and .69 are considered to have marginal reliability, and coefficients under .60 are considered unacceptable reliability (Reinard, 2006). However, when analyzing the content and cluster scores, it is apparent that coefficient alpha scores tend to vary from measures of good reliability ($\alpha = .84$; mathematics content) to measures of unacceptable reliability ($\alpha = .45$; Patterns and Algebra). Despite this phenomenon, the reliability of the test scores is

based on the statewide population and may not be representative of GH DFG students. Consequently, data used in this study may be different. Since there is no definitive proof, instrumentation can potentially be viewed as a possible threat to the internal validity of this study.

Statistical Regression

Statistical regression usually occurs in studies where participants are selected on the basis of their extremely high or extremely low scores on a pre-intervention measure; scores tend to regress to the mean during retesting (Campbell & Stanley, 1963). Since participants were not chosen based on extremely high or extremely low scores, Statistical regression in this study is not seen as a viable threat to internal validity.

Differential Selection of Participants

Differential selection of participants refers to the selection of participants who have differences prior to the start of the study that may, in part, account for a portion of the differences found in the post-test (Campbell & Stanley, 1963). “This threat to internal validity, which clearly becomes realized at the data collection stage, most often occurs when already-formed (i.e., non-randomized) groups are compared” (Onwuegbuzie, 2003, p. 76). In this study, participants were assigned to classrooms (i.e., co-taught inclusive and non-inclusive) prior to the onset of this investigation by school district administration. While the researcher of this study was unable to control for class placement, similarity of cohorts can be assumed based the criteria used to place students in classes. More specifically, second grade standardized test scores on the New Jersey Proficiency Assessment of State Standards (NJ PASS) in mathematics and language arts were used as a baseline to establish a normal distribution of student ability levels in each

classroom (i.e., balanced for high, average, and low achieving students). An independent samples t test was performed to account for the variability associated with the differences between the sample means of the comparison groups. The independent samples t test is comprised of two main parts; Levene's test for the assumption for equal variances, and the t test for Equality of Means (Leech, Barrett, & Morgan, 2008). "A critical assumption of the t test is that the variances (standard deviation squared) of the two groups (inclusion and non-inclusion) are approximately equal" (p.86).

Onwuegbuzie (2003) argues that it is more difficult to conduct controlled, randomized studies in natural educational settings, thus differential selection of participants is a common threat to internal validity. To limit the degree of threat to internal consistency arising from differential selection of participants, the researcher of this study conducted an independent samples t test of the pre-measure of achievement to check for initial equivalence of the groups (cognitive factors) and selected a district that has little demographic (e.g., socio-economic, cultural) diversity. Given that the research samples were from two already existing populations, not from one population, the goal was to have the groups as similar as possible on all relevant variables except for the independent/grouping variable. None the less, participants in the comparison groups in this study may have had different characteristics (e.g., affective, personality) that can potentially influence post-test measures and should be viewed as a potential threat to the internal validity of this study.

Mortality

Mortality refers to the attrition of research participants specifically, a reduction in the number of participants selected for the study or those who do not complete every

phase in the investigation (Campbell & Stanley, 1963). After a review of the transfer records, no students moved in or out of the Grade 3 during the course of this study; all participants who started in the study also completed the study. Also, no students were classified eligible for special education or related services or Section 504 in the Grade 3 during the course of this study. As a result of the aforementioned factors, mortality is not considered a threat to the internal validity of this study.

Selection Interaction Effects

Many of the aforementioned threats to internal validity can interact with the differential selection of participants to generate an effect that looks like the intervention effect. However, selection by history, selection by mortality, and selection by maturation threats are not likely to occur in this study based on the effort that was made to determine if these factors were operating and design selection that controls for potential problems.

Research Design/ Data Collection and Threats to External Validity

Population Validity

Population validity refers to the degree to which findings are generalizable from the sample of study participants to the larger population of individuals including various sub-populations within the larger population (Smith & Glass, 1987). Onwuegbuzie (2003) posited that “population validity is a threat in virtually all educational studies because (a) all members of the target population rarely are available for selection in a study, and (b) random samples are difficult to obtain due to practical considerations such as time, money, resources, and logistics” (p. 80). Due to the nature of the district practice for administration to place students, random sampling was not possible as a design element in this study. Therefore caution should be taken when generalizing the results of

this study based upon the population participating as representative of the larger population of non-disabled students enrolled in co-taught mathematics classes.

Ecological Validity

Ecological validity refers to the extent to which the findings from a study can be generalized across settings, conditions, variables and contexts (Smith & Glass, 1987). In this study, participants were selected from an upper middle class suburban elementary school district (P-6), located in northern New Jersey. The participants in this study were enrolled in general education classes with approximately 20 students in each. The ethnic composition is composed of Caucasian (91%), Hispanic (5.2%), African American (0.8%), and Asian (3%). Low income families represent only 0.8% of the district. The District Factor Group (DFG) is reported as GH (DFGs are labeled from A [lowest] to J [highest] and are an indicator of the socioeconomic status of citizens in each district). As a result, caution should be taken when generalizing the results of this study to the larger population since participants were enrolled in an affluent district with small class size and an apparent lack of diversity. The results may not apply to a large diverse urban district with large class size.

Temporal Validity

Temporal validity refers to the extent to which research findings can be generalized over time (Onwuegbuzie, 2003). Onwuegbuzie purports that temporal validity is a common threat to the external validity of the educational context since most studies are conducted at one period of time. Given that this study took place during one academic year, temporal validity can be viewed as a possible threat to the external validity of this study.

External Validity of Operations – Specificity of Variables

Specificity of variables “is a threat to external validity in almost every study” and “refers to the fact that any given inquiry is undertaken utilizing a) a specific type of individual, b) at a specific time, c) at a specific location, d) under specific set of circumstances, e) based on a specific operational definition of the independent variable, f) using specific dependent variables, and g) using specific instruments to measure all the variables” (Onwuegbuzie, 2003, p. 81). The more unique the variables are to the study the less generalizable the findings will be. To control for this, the researcher of this study operationally defined variables in a way that has meaning outside of the setting. However, since each group represents a different population and the way in which groups are defined affects the generalizability of the results, extreme caution will be taken when discussing the findings in Chapter V.

Data Analysis and Threats to Internal Validity

Statistical Regression

At the analysis stage, statistical regression occurs when researchers attempt to statistically equate groups, analyze change scores, or analyze longitudinal data. In this study, the researcher sought to statistically equate intact groups that may have had pre-existing differences. According to Onwuegbuzie (2003), these differences often threaten the internal validity of the findings. Unfortunately, since an analysis of covariance was not possible, statistical regression presents a possible threat to the internal validity of this study.

Type I and II Errors

“Because the choice of probability level, α , is made before execution of the study, researchers need to consider the relative seriousness of committing a Type I versus Type II error and select α accordingly” (Gay, Mills & Airasian, 2009, p. 332). For the purpose of this study, the preselected $\alpha = .05$ meaning, that any differences between ± 2 standards deviations (as illustrated by the normal curve) will be considered as chance differences at the .05 level. Thus, there is a 5% probability of incorrectly rejecting the null hypothesis therefore making a Type I error. Decreasing $\alpha = .00001$, for example, decreases the chances of making a Type I error but increases the chances of making a Type II error (i.e., failing to incorrectly reject a null hypothesis). These types of errors pose a threat to the internal validity at the data analysis stage (Onwuegbuzie, 2003). Even the effect sizes, which is a numerical expression of the strength or magnitude of the reported relationship, “are strongly influenced by number and size of samples ... and are not immune from internal validity threats” (p. 83).

Data Analysis and Threats to External Validity

Population Validity

According to Onwuegbuzie (2003), “threats to population validity often occur at the data analysis stage because researchers fail to disaggregate their data, incorrectly assuming that their findings are invariant across all subsamples inherent in their study” (p. 84). Since this educational study looked at a single school, the results could not be generalized to cover children at every U.S. school. If for example the researcher had available as his accessible population the entire state, then a random selection of this accessible population would closer represent her target population. There is a tradeoff

however because it would take considerable resources to ensure the treatments were being administered properly so as to ensure treatment fidelity. Faced with such a tradeoff, this researcher chose to lean toward tighter control of the experiment and face greater uncertainty regarding its generalizability to the target population. As a result, this limitation can potentially pose a threat to the external validity of this study.

Specificity of Variables

Specificity of variables can be a threat to external validity at the data analysis stage by means of the way the independent and dependent variables are operationalized. Onwuegbuzie (2003) contends that, “because every distribution of scores is sample specific, the extent to which a variable categorized using local norms can be generalized outside the sample is questionable”(p. 85). Variables in this study were described in sufficient detail to allow another researcher to replicate the study. In addition, the description and definition of variables employed measurement instruments that are themselves reliable and valid. In this study, standard scores on the NJ ASK and NJ PASS were utilized as a measure to counter threats to external validity associated with operationalization of variables.

In summary, there are potential threats to the internal and external validity of this study at the research design/data collection and data analysis level. At the research design/data collection level, testing and instrumentation can be viewed as possible threats to the internal validity of this study. Also at the research design/data collection level, population, ecological, and temporal validity may pose a threat to the external validity of this study. Concomitantly, at the data analysis level, statistical regression can potentially

pose a threat to the internal validity of this study. Also at the data analysis level, population validity may pose a threat to the external validity of this study.

“Providing information about sources of invalidity and rival explanations (a) allows readers to better contextualize the underlying findings, (b) promotes external replications, (c) provides a direction for future research, and (d) advances the conducting of validity meta analyses and thematic effect sizes” (Onwuegbuzie, 2003, p. 87). Since neither a randomized experiment nor a quasi-experiment (with a manipulated independent variable) was not feasible due to limitations in time, funding, accessibility of a larger and more diverse sample, and availability of options to standardized achievement tests, this researcher chose to lean toward tighter control of the experiment and face greater uncertainty regarding its generalizability to the target population. “Non-experimental research may also be important even when experiments are possible as a means to suggest or extend experimental studies, to provide corroboration, and to provide increased evidence of the external validity of previously established experimental research findings; non-experimental research is frequently an important and appropriate mode of research in education” (Johnson, 2001, p. 3).

Summary

The purpose of this study was to determine the extent to which placement in co-taught inclusive setting correlates with non-disabled students’ academic achievement. Pre-achievement for the comparison groups was measured utilizing the NJPASS test. An independent samples *t* test was performed to account for the variability associated with the differences between the sample means of the comparison groups. The independent samples *t* test is comprised of two main parts; Levene’s test for the assumption for equal

variances, and the t test for Equality of Means. Further, an analysis of the influence of the independent/grouping variable of co-taught inclusion (general and special education teacher and general and special education students) on the dependent variable of academic performance as measured by Grade 3 non-disabled students full scale and cluster scores (Number and Numerical Operations Geometry and Measurement, Patterns and Algebra, Data Analysis, Probability and Discrete Mathematics and Problem Solving) in mathematics on the New Jersey Assessment of Skills and Knowledge (NJ ASK). The data were analyzed utilizing independent samples t test conducted with SPSS version 16 at the .05 probability level or higher. Potential threats to the internal and external validity of this study at the research design/data collection and data analysis level were identified. Chapter IV presents a review of the results and statistical analysis of this study.

Chapter IV

ANALYSIS AND RESULTS

Description of the Study

It remains unclear in the literature if and how placement in a co-taught inclusive classroom influences the academic achievement of non-disabled students at the elementary level. What is clear is that the number of students with disabilities served under IDEIA continues to increase at a rate higher than the general population (USDOE, 2007). Moreover, schools are required to make AYP per NCLB despite the disparity in student ability level attributed to the increased number of disabled students in the general education [inclusive] classroom. With a growing number of students served and specific provisions in the amendments calling for more access to the general curriculum for these students, research on inclusive practices is imperative to understand its effects and barriers to overcome (USDOE, 2009). This study explored the following question: To what extent does placement in co-taught inclusive setting correlate with non-disabled students' academic achievement?

The participants in this study were selected from an upper middle class suburban elementary school district (P-6), located in northern New Jersey. The participants were Grade 3 non-disabled students enrolled in co-taught inclusion and non-inclusion general education classes. An analysis of the influence of the independent/grouping variable of co-taught inclusion (general and special education teacher and general and special education students) on the dependent variable of academic performance as measured by Grade 3 non-disabled students full scale and cluster scores in mathematics on the New Jersey Assessment of Skills and Knowledge (NJ ASK) was conducted.

Methodology

The purpose of this study was to determine the extent to which placement in co-taught inclusive setting correlates with non-disabled students' academic achievement. Pre-achievement for the comparison groups was measured utilizing the NJPASS test. An independent samples t test was performed to account for the variability associated with the differences between the sample means for the comparison groups (i.e., inclusion and non-inclusion). The independent samples test is comprised of two main parts, Levene's test for the assumption for equal variances, and the t test for Equality of Means.

Measures of central tendency were calculated and analyzed; the average performance [mean] of each placement group on the NJ ASK mathematics scores and the spread of NJ ASK scores around the mean [standard deviation]. Inferential measures were also calculated and analyzed: t tests were used to determine whether the scores of the respective groups were significantly different from one another and an analysis of the influence of the independent/grouping variable of co-taught inclusion (general and special education teacher and general and special education students) on the dependent variable of academic performance as measured by Grade 3 non-disabled students full scale and cluster scores (Number and Numerical Operations Geometry and Measurement, Patterns and Algebra, Data Analysis, Probability and Discrete Mathematics and Problem Solving) in mathematics on the New Jersey Assessment of Skills and Knowledge (NJ ASK). The data were analyzed utilizing an independent samples t test conducted with SPSS version 16 at the .05 probability level or higher.

The characteristics of the comparison groups (i.e., free lunch eligibility percentage, special education classification percentage, basic skills eligibility status, and

pre-achievement) are reported in Table 2. The comparison groups differ on: free lunch eligibility by 1.1% or 1 student (non-inclusion group); special education classification by 27.6% or 5 students; basic skills eligibility by 1.2% or 2 students; and pre-achievement mean group score by .69 of a point.

Table 2

Group Characteristics

| Group Characteristics | Inclusion | Non-Inclusion |
|-----------------------------|-----------|---------------|
| Free lunch eligibility % | 0 | 1.1 |
| Special ed classification % | 28.6 | 1 |
| Basic skills eligibility % | 4.9 | 6.1 |
| Pre-Achievement Mean Score | 30.33 | 31.02 |

Pre-Achievement Independent Samples Test

“The *t* test is used to determine whether two groups of scores are significantly different at a selected probability level”(Gay, Mills, & Airasian, 2009, p. 335). “The *t* test for independent samples is a parametric test of significance used to determine whether, at a selected probability level, a significant difference exists between the means of the two independent samples” (p. 335). An independent samples *t* test was performed to account for the variability associated with the differences between inclusion and non-inclusion classrooms. As can be seen in Table 3, the inclusion group had an average pre-achievement NJ PASS mathematics score of 30.33, while the non-inclusion group had an average pre-achievement NJ PASS mathematics score of 31.02. The NJ PASS mathematics scores for grade 2 are reported as points earned (PE), with score ranges from 0-22 (Partially Proficient), 23-33 (Proficient), and 34-40 (Advanced Proficient). Therefore, the average pre-achievement scores for the comparison groups fell within the proficient range.

Table 3
NJ PASS Group Statistics

| Group Statistics | | | | | |
|------------------|---------------|----|-------|----------------|--------------------|
| Teacher | | N | Mean | Std. Deviation | Std. Error Mean |
| NJPASS | Inclusion | 15 | 30.33 | 6.008 | 1.551 |
| | Non-Inclusion | 84 | 31.02 | 5.810 | .634 |

The independent samples *t* test (see Table 4) is comprised of two main parts, Levene’s test for the assumption for equal variances, and the *t* test for Equality of Means. “A critical assumption of the *t* test is that the variances (standard deviation squared of the groups are approximately equal” (Leech, Barrett, & Morgan, 2008, p. 86). In this case, those variances are 6.00² and 5.81². Levene’s test provides an *F* and a Significance Level *p*, which in this case is not statistically significant (.973). Because Levene’s test is not statistically significant, the assumption has not been violated and as a result the Equal Variances Assumed line is used to interpret and report on the *t* test.

The appropriate *t* is -.422 with 97 *df* and *p* = .674. Thus, there is no statistically significant difference between pre-achievement scores on the NJ PASS for students placed in inclusion and non-inclusion classes; we fail to reject the null hypothesis of no difference in the population of inclusion and non-inclusion students. The mean difference in math pre-achievement between inclusion and non-inclusion students in this sample was -.690. The 95% confidence interval of the difference tells us that if we repeated the study 100 times, 95 of the times the true (population) difference would fall within the

confidence interval, which for math pre-achievement, is between -3.94 points and 2.56 points.

Table 4

NJ PASS Independent Sample Test

| Independent Samples Test | | | | | | | | | |
|-----------------------------|---|------|------------------------------|--------|-----------------|-----------------|-----------------------|---|-------|
| NJ PASS | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
| | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
| | | | | | | | | Lower | Upper |
| Equal variances assumed | .001 | .973 | -.422 | 97 | .674 | -.690 | 1.637 | -3.939 | 2.558 |
| Equal variances not assumed | | | -.412 | 18.978 | .685 | -.690 | 1.676 | -4.198 | 2.817 |

The effect size (*d*) was calculated to measure the magnitude of the treatment effect or more specifically, the strength of the relationship between two variables. Effect sizes are, for the most part, a valuable best practice in research because they represent a standard measure by which outcomes can be assessed (Cohen, 1988). For the purpose of this study, Glass's delta formula was used to calculate effect size. Glass's delta formula can be defined as the mean difference between the experimental (inclusion group) and control group (non-inclusion group) divided by the standard deviation of the control group (non-inclusion group). Cohen (1988) defined effect sizes as "small, *d* = .2," "medium, *d* = .5," and "large, *d* = .8", stating that "there is a certain risk inherent in offering conventional operational definitions for those terms for use in power analysis in

as diverse a field of inquiry as behavioral science" (p. 25). The effect size for the pre-achievement measure was small (-0.12).

Research Questions

Research Question 1.

What is the influence of placement in the co-taught inclusive setting on the performance of Grade 3 non-disabled students in the area of mathematics as measured by the NJ ASK?

An independent samples *t* test was performed to account for the variability associated with the differences between inclusion and non-inclusion classrooms on overall mathematics performance as measured by the NJ ASK. As can be seen in Table 5, the inclusion group had an average NJ ASK mathematics performance score of 252, while the non-inclusion group had an average NJ ASK mathematics performance score of 246. The NJ ASK mathematics scores for Grade 3 are reported as scale scores, with score ranges from 100-199 (Partially Proficient), 200-249 (Proficient), and 250-300 (Advanced Proficient). The average achievement scores for non-disabled students placed in inclusion classes fell within the advanced proficient range while scores for non-disabled students placed in non-inclusion classes fell within the proficient range.

Table 5

Proficiency Group Statistics

| Group Statistics | | | | | |
|------------------|---------------|----|--------|----------------|-----------------|
| Group | | N | Mean | Std. Deviation | Std. Error Mean |
| Proficiency | Inclusion | 15 | 252.00 | 29.730 | 7.676 |
| | Non-Inclusion | 84 | 246.01 | 35.735 | 3.899 |

The independent samples *t* test (see Table 6) was not found to be statistically significant (.233). As a result, the equity assumption has not been violated and the Equal Variances Assumed line is used to interpret and report on the *t* test.

The appropriate *t* is .612 with 97 *df* and *p* = .542. Thus, there is no statistically significant difference between achievement scores on the NJ ASK for students placed in inclusion and non-inclusion classes; I fail to reject the null hypothesis of no difference in the population of inclusion and non-inclusion students. The mean difference in math pre-achievement between inclusion and non-inclusion students in this sample was 5.988. The 95% confidence interval of the difference tells us that if we repeated the study 100 times, 95 of the times the true (population) difference would fall within the confidence interval, which for math achievement, is between -13.446 points and 25.442 points.

Table 6
Proficiency Independent Samples Test

| Independent Samples Test | | | | | | | | | |
|-----------------------------|---|------|------------------------------|--------|-----------------|-----------------|-----------------------|---|--------|
| Proficiency | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
| | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
| | | | | | | | | Lower | Upper |
| | | | | | | | | | |
| Equal variances assumed | 1.439 | .233 | .612 | 97 | .542 | 5.988 | 9.792 | -13.446 | 25.422 |
| Equal variances not assumed | | | .696 | 21.910 | .494 | 5.988 | 8.610 | -11.872 | 23.848 |

The effect size for overall mathematics performance was calculated and found to be small (0.17).

Cluster Area Performance

According to the NJ ASK Score Interpretation Manual Grades 3-8 (2010):

The Mathematics test measures students' ability to solve problems by applying mathematical concepts. The Mathematics component measures knowledge and skills in four clusters; numeric codes for the corresponding standards are indicated in parentheses:

- Number and Numerical Operations (4.1)
- Geometry and Measurement (4.2)
- Patterns and Algebra (4.3)
- Data Analysis, Probability, and Discrete Mathematics (4.4)

Mathematics contains both multiple-choice and constructed-response items.

There are two types of constructed-response items: extended constructed-response (previously known as open-ended) and short constructed-response.

The extended constructed-response items require students to solve a problem as well as explain their solution. The short constructed-response items only require an answer, not an explanation. Some mathematics items are also classified and reported as Problem Solving which means that the items require problem solving skills in applying mathematical concepts (for example: solving, applying, reasoning, communicating, modeling, constructing, etc.). Problem Solving items are defined based on the

Mathematical Processes standard of the NJCCCS: Problem posing and problem solving involve examining situations that arise in mathematics and other disciplines and in common experiences, describing these situations mathematically, formulating appropriate mathematical questions, and using a variety of strategies to find solutions. Through problem solving, students experience the power and usefulness of mathematics. Problem solving is interwoven throughout the grades to provide a context for learning and applying mathematical ideas. (pp. 14, 15)

Table 7 represents the total raw score possible for each of the mathematics cluster areas.

Table 7

Total Points Possible on NJ ASK 3-8, by Content, Cluster and Grade in Mathematics

| Grade | 3 | 4 | 5 | 6 | 7 | 8 |
|--|-----------|-----------|-----------|-----------|-----------|-----------|
| Cluster | | | | | | |
| Number & Numerical Operations | 20 | 20 | 15 | 13 | 13 | 11 |
| Geometry & Measurement | 11 | 11 | 16 | 17 | 13 | 17 |
| Patterns & Algebra | 11 | 11 | 8 | 9 | 12 | 13 |
| Data Analysis, Probability, & Discrete Mathematics | 8 | 8 | 8 | 10 | 11 | 8 |
| Problem Solving | 25 | 24 | 25 | 28 | 27 | 32 |
| Total Points Possible | 50 | 50 | 47 | 49 | 49 | 49 |
| Multiple Choice | 35 | 35 | 33 | 32 | 32 | 32 |
| Short Constructed Response ⁷ | 6 | 6 | 8 | 8 | 8 | 8 |
| Extended Constructed Response ³ | 9 | 9 | 6 | 9 | 9 | 9 |

From the NJ ASK 2010 Score Interpretation Manual Grades 3-8, p. 15

Sub-question a: What is the difference in Number and Numerical Operations cluster scores as measured by the New Jersey ASK 3 for non-disabled students assigned to co-taught inclusive mathematics class verses non-inclusive class.

An independent samples *t* test was performed to account for the variability associated with the differences between inclusion and non-inclusion classrooms on Number and Numeric Operations cluster scores as measured by the NJ ASK. As can be seen from Table 8, the inclusion group had an average NJ ASK Number and Numeric Operations Cluster Score of 16.33, whereas the non-inclusion group had an average NJ ASK Number and Numeric Operations cluster score of 14.93 of a total possible raw score of 25 points.

Table 8

Number and Numeric Operations Group Statistics

| Group Statistics | | | | | |
|------------------|---------------|----|-------|----------------|-----------------|
| Group | | N | Mean | Std. Deviation | Std. Error Mean |
| NumericOp | Inclusion | 15 | 16.33 | 2.289 | .591 |
| | Non-Inclusion | 84 | 14.93 | 3.827 | .418 |

The Independent *t* Samples Test (see Table 9) was found to be statistically significant (.042). Because Levene’s test is significant, the assumption has been violated and as a result the Equal variances not assumed is used to interpret and report on the *t* test.

The appropriate *t* is 1.941 with 30.2 *df* and *p* = .062. Thus, there is a statistically significant difference between Number and Numeric Operations cluster scores on the NJ ASK for students placed in inclusion and non-inclusion classes; I reject the null hypothesis of no difference in the population of inclusion and non-inclusion students. The

mean difference in Number and Numeric Operations cluster scores between inclusion and non-inclusion students in this sample was 1.405. The 95% confidence interval of the difference tells us that if we repeated the study 100 times, 95 of the times the true (population) difference would fall within the confidence interval, which for Numeric Operations Cluster scores, is between -.073 points and 2.882 points. Furthermore, the effect size for Number and Numeric Operations cluster scores was calculated and found to be small (0.37).

Table 9

Number and Numeric Operations Independent Samples Test

| Independent Samples Test | | | | | | | | | | |
|-----------------------------|--|---|------|------------------------------|--------|-----------------|-----------------|-----------------------|---|-------|
| Numeric Operations | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
| | | | | | | | | | Lower | Upper |
| Equal variances assumed | | 4.253 | .042 | 1.375 | 97 | .172 | 1.405 | 1.022 | -.623 | 3.433 |
| Equal variances not assumed | | | | 1.941 | 30.200 | .062 | 1.405 | .724 | -.073 | 2.882 |

Sub-question b: What is the difference in Geometry and Measurement cluster scores as measured by the New Jersey ASK 3 for non-disabled students assigned to co-taught inclusive mathematics class verses non-inclusive class.

An independent samples *t* test was performed to account for the variability associated with the differences between inclusion and non-inclusion classrooms on Geometry and Measurement cluster scores as measured by the NJ ASK. As can be seen in Table 10, the inclusion group had an average NJ ASK Geometry and Measurement cluster scores score of 8.47, while the non-inclusion group had an average NJ ASK Geometry and Measurement cluster score of 8.69 of a total possible raw score of 11 points.

Table 10
Geometry and Measurement Group Statistics

| Group Statistics | | | | | |
|------------------|---------------|----|------|----------------|-----------------|
| Group | | N | Mean | Std. Deviation | Std. Error Mean |
| GeoMeas | Inclusion | 15 | 8.47 | 1.598 | .413 |
| | Non-Inclusion | 84 | 8.69 | 1.875 | .205 |

The independent *t* samples test (see Table 11) was not found to be statistically significant (.741). As a result, the equity assumption has not been violated and the Equal variances assumed line is used to interpret and report on the *t* test.

The appropriate *t* is -.434 with 97 *df* and *p* = .665. Thus, there is no statistically significant difference between Geometry and Measurement cluster scores on the NJ ASK for students placed in inclusion and non-inclusion classes; I fail to reject the null hypothesis of no difference in the population of inclusion and non-inclusion students. The mean difference in math pre-achievement between inclusion and non-inclusion students in this sample was -.224. The 95% confidence interval of the difference tells us that if we repeated the study 100 times, 95 of the times the true (population) difference would fall within the confidence interval, which for Geometry and Measurement cluster scores, is

between -1.246 points and .799 points. Furthermore, the effect size for Geometry and Measurement cluster scores was calculated and found to be small (-0.12).

Table 11

Geometry and Measurement Independent Samples Test

| Independent Samples Test | | | | | | | | | |
|-----------------------------|---|------|------------------------------|--------|-----------------|-----------------|-----------------------|---|-------|
| Geometry & Measurement | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
| | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
| | | | | | | | | Lower | Upper |
| Equal variances assumed | .109 | .741 | -.434 | 97 | .665 | -.224 | .515 | -1.246 | .799 |
| Equal variances not assumed | | | -.486 | 21.519 | .632 | -.224 | .460 | -1.180 | .732 |

Sub-question c: What is the difference in Patterns and Algebra cluster scores as measured by the New Jersey ASK 3 for non-disabled students assigned to co-taught inclusive mathematics class verses non-inclusive class.

An independent samples *t* test was performed to account for the variability associated with the differences between inclusion and non-inclusion classrooms on Patterns and Algebra Cluster Scores as measured by the NJ ASK. As can be seen in Table 12, the inclusion group had an average NJ ASK Patterns and Algebra cluster score of 8.33, while the non-inclusion group had an average NJ ASK Patterns and Algebra Cluster Score of 7.62 of a total possible raw score of 11 points.

Table 12

Patterns and Algebra Group Statistics

| Group Statistics | | | | | |
|------------------|---------------|----|------|----------------|-----------------|
| Group | | N | Mean | Std. Deviation | Std. Error Mean |
| PatAlg | Inclusion | 15 | 8.33 | 2.637 | .681 |
| | Non-Inclusion | 84 | 7.62 | 2.389 | .261 |

The independent samples *t* test (see Table 13) was not found to be statistically significant (.954). As a result, the equity assumption has not been violated and the Equal variances assumed line is used to interpret and report on the *t* test.

The appropriate *t* is 1.050 with 97 *df* and *p* = .296. Thus, there is no statistically significant difference between Patterns and Algebra cluster scores on the NJ ASK for students placed in inclusion and non-inclusion classes; I fail to reject the null hypothesis of no difference in the population of inclusion and non-inclusion students. The mean difference in Patterns and Algebra cluster scores between inclusion and non-inclusion students in this sample was .714. The 95% confidence interval of the difference tells us that if we repeated the study 100 times, 95 of the times the true (population) difference would fall within the confidence interval, which for Patterns and Algebra Cluster scores, is between -.636 points and 2.064 points. Furthermore, the effect size for Patterns and Algebra cluster scores was calculated and found to be small (0.30).

Table 13

Patterns and Algebra Independent Samples Test

| Independent Samples Test | | | | | | | | | |
|-----------------------------|---|------|------------------------------|--------|-----------------|-----------------|-----------------------|---|-------|
| Patterns & Algebra | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
| | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
| | | | | | | | | Lower | Upper |
| Equal variances assumed | .003 | .954 | 1.050 | 97 | .296 | .714 | .680 | -.636 | 2.064 |
| Equal variances not assumed | | | .980 | 18.340 | .340 | .714 | .729 | -.815 | 2.244 |

Sub-question d: What is the difference in Data Analysis, Probability and Discrete Mathematics cluster scores as measured by the New Jersey ASK 3 for non-disabled students assigned to co-taught inclusive mathematics class verses non-inclusive class.

An independent samples *t* test was performed to account for the variability associated with the differences between inclusion and non-inclusion classrooms on Data Analysis, Probability and Discrete Mathematics cluster scores as measured by the NJ ASK. As can be seen in Table 14, the inclusion group had an average NJ ASK Data Analysis, Probability and Discrete Mathematics cluster score of 5.27, while the non-inclusion group had an average NJ ASK Data Analysis, Probability and Discrete Mathematics cluster scores of 5.32 of a total possible raw score of 8 points.

Table 14

Data Analysis, Probability and Discrete Mathematics Group Statistics

| Group Statistics | | | | | |
|------------------|---------------|----|------|----------------|-----------------|
| Group | | N | Mean | Std. Deviation | Std. Error Mean |
| DataProb | Inclusion | 15 | 5.27 | 1.831 | .473 |
| | Non-Inclusion | 84 | 5.32 | 2.095 | .229 |

The independent samples *t* test (see Table 15) was not found to be statistically significant (.580). As a result, the equity assumption has not been violated and the Equal variances assumed line is used to interpret and report on the *t* test.

The appropriate *t* is -.095 with 97 *df* and *p* = .925. Thus, there is no statistically significant difference between Data Analysis, Probability and Discrete Mathematics cluster scores on the NJ ASK for students placed in inclusion and non-inclusion classes; I fail to reject the null hypothesis of no difference in the population of inclusion and non-inclusion students. The mean difference in Data Analysis, Probability and Discrete Mathematics cluster scores between inclusion and non-inclusion students in this sample was -.055. The 95% confidence interval of the difference tells us that if we repeated the study 100 times, 95 of the times the true (population) difference would fall within the confidence interval, which for Data Analysis, Probability and Discrete Mathematics cluster scores, is between -1.20 points and 1.091 points. Furthermore, the effect size for Data Analysis, Probability and Discrete Mathematics cluster scores was calculated and found to be small (-0.03).

Table 15

Data Analysis, Probability and Discrete Mathematics Independent Samples Test

| Independent Samples Test | | | | | | | | | |
|-----------------------------|---|------|------------------------------|--------|-----------------|-----------------|-----------------------|---|-------|
| Data & Probability | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
| | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
| | | | | | | | | Lower | Upper |
| Equal variances assumed | .308 | .580 | -.095 | 97 | .925 | -.055 | .577 | -1.200 | 1.091 |
| Equal variances not assumed | | | -.104 | 21.117 | .918 | -.055 | .525 | -1.146 | 1.037 |

Sub-question e: What is the difference in Problem Solving cluster scores as measured by the New Jersey ASK 3 for non-disabled students assigned to co-taught inclusive mathematics class verses non-inclusive class.

An independent samples *t* test was performed to account for the variability associated with the differences between inclusion and non-inclusion classrooms on Problem Solving cluster scores as measured by the NJ ASK. As can be seen in Table 16, the inclusion group had an average NJ ASK Problem Solving cluster score of 18.20, while the non-inclusion group had an average NJ ASK Problem Solving cluster score of 17.87 of a total possible raw score of 8 points.

Table 17

Problem Solving Independent Samples Test

| Independent Samples Test | | | | | | | | | |
|-----------------------------|---|------|------------------------------|--------|-----------------|-----------------|-----------------------|---|-------|
| Problem Solving | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
| | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
| | | | | | | | | Lower | Upper |
| Equal variances assumed | 2.325 | .131 | .236 | 97 | .814 | .331 | 1.402 | -2.451 | 3.113 |
| Equal variances not assumed | | | .285 | 23.560 | .778 | .331 | 1.161 | -2.067 | 2.729 |

Hypotheses

H_0^1 : There is no significant difference in the performance scores in mathematics on the New Jersey ASK 3 for non-disabled students assigned to co-taught inclusive mathematics class verses non-inclusive mathematics class.

The results of this investigation (see Table 18) revealed that there was no statistically significant differences for overall mathematics performance, and Geometry and Measurement, Patterns and Algebra, Data Analysis, Probability and Discrete Mathematics and Problem Solving cluster scores on the NJ ASK for students placed in inclusion and non-inclusion classes; I fail to reject the null hypothesis of no difference in the population of inclusion and non-inclusion students. However, on Number and Numeric Operations, students placed in inclusion performed significantly different [better] than students placed in non-inclusion classes; I reject the null hypothesis of no

difference in the population of inclusion and non-inclusion students. In other words, placement in a co-taught inclusive classroom does not influence the achievement of non-disabled students in mathematics with the exception of performance on Number and Numeric Operations when prior [pre] achievement is controlled.

Table 18

Statistical Results of the Study

| NJ ASK | | F | Sig. | t | df | Sig. 2 tailed |
|---|-----------------------------|-------|-------|--------|------|---------------|
| Overall Performance | Equal variances assumed | 1.439 | 0.233 | 0.612 | 97 | 0.542 |
| Number and Numeric Operations | Equal variances not assumed | 4.253 | 0.042 | 1.941 | 30.2 | 0.062 |
| Geometry and Measurement | Equal variances assumed | 0.109 | 0.741 | -0.434 | 97 | 0.665 |
| Patterns and Algebra | Equal variances assumed | 0.003 | 0.954 | 1.05 | 97 | 0.296 |
| Data Analysis, Probability and Discrete Mathematics | Equal variances assumed | 0.308 | 0.58 | -0.095 | 97 | 0.925 |
| Problem Solving | Equal variances assumed | 2.325 | 0.131 | 0.236 | 97 | 0.814 |

Summary

The purpose of this investigation was to examine the academic achievement of non-disabled students educated in co-taught inclusive classrooms and compare them with the academic achievement of students non-disabled students educated in non-inclusive [general education] classrooms.

Pre-achievement for the treatment and control groups was measured utilizing the NJPASS test. An independent samples test was performed to account for the variability associated with the differences between the sample means for the comparison groups (i.e., inclusion and non-inclusion). The independent *t* samples test is comprised of two main parts, Levene’s test for the assumption for equal variances, and the *t* test for Equality of Means.

Measures of central tendency were calculated and analyzed; the average performance [mean] of each placement group on the NJ ASK mathematics scores and the spread of NJ ASK scores around the mean [standard deviation]. Inferential measures were also calculated and analyzed: *t* tests were used to determine whether the scores of the respective groups were significantly different from one another and an analysis of the influence of the independent/grouping variable of co-taught inclusion (general and special education teacher and general and special education students) on the dependent variable of academic performance as measured by Grade 3 non-disabled students full scale and cluster scores (Number and Numerical Operations Geometry and Measurement, Patterns and Algebra, Data Analysis, Probability and Discrete Mathematics and Problem Solving) in mathematics on the New Jersey Assessment of Skills and Knowledge (NJ ASK). The data were analyzed utilizing an independent samples *t* test conducted with SPSS version 16 at the .05 probability level or higher.

The results of this investigation revealed that there was no statistically significant difference for overall mathematics performance, and Geometry and Measurement, Patterns and Algebra, Data Analysis, Probability and Discrete Mathematics and Problem Solving cluster scores on the NJ ASK for students placed in inclusion and non-inclusion classes; I fail to reject the null hypothesis of no difference in the population of inclusion and non-inclusion students. However, on Number and Numeric Operations, students placed in inclusion performed significantly different [better] than students placed in non-inclusion classes; I reject the null hypothesis of no difference in the population of inclusion and non-inclusion students. In other words, placement in a co-taught inclusive classroom does not influence the achievement of non-disabled students in mathematics

with the exception of performance on Number and Numeric Operations when prior [pre] achievement is controlled. Chapter V provides a summary of the findings and conclusions and includes a discussion concerning implications for practice and future research.

Chapter V

CONCLUSIONS AND RECOMMENDATIONS

“Helping children with disabilities has become part of American education with varying degrees of acceptance and tolerance over the years, and efforts to provide special education have become controversial” (Porfeli, Algozzine, Nutting, & Queen, 2006, p. 6). Today all public school districts provide a continuum of special services and educational programs for disabled students under NCLB and IDEA. Serving students with special needs can be a challenging task for a small school district such as the one where this study was conducted. Many states, including New Jersey, are holding districts, schools, and teachers accountable for the academic achievement of students regardless of class placement. As a result, educators are continually examining variables that influence student achievement particularly on high-stakes state assessments. To meet rigorous standards, teachers are now encouraged to differentiate instruction for a greater range of student ability levels. Implicit in this statement is the belief that accommodating the needs of a few may place the learning opportunities of the many at risk (York & Tundidor, 1995). Herein resides the problem; schools are required to make predetermined AYP levels regardless of where the students start academically and despite the disparity in student ability level attributed to the increased number of disabled students in the general education [inclusive] classroom. A question that has been asked in the past is, what influence does the inclusion of students with disabilities in the general education classroom have on both disabled and non-disabled student achievement (Peltier, 1997; Salend & Duhaney, 1999)?

The purpose of this study was to determine the extent to which placement in a co-taught inclusive setting correlates with non-disabled students' academic achievement. Specifically, an analysis of the influence of the independent/grouping variable of co-taught inclusion (general and special education teacher and general and special education students) on the dependent variable of academic performance as measured by Grade 3 non-disabled students overall and cluster scores in mathematics on the New Jersey Assessment of Skills and Knowledge (NJ ASK). By concentrating on variables that can influence student achievement, that is, teaching modality and class placement, this study aims to produce research-based evidence to assist educators, legislators, and parents in the design, implementation and/or choice of instructional programs that maximize learning and therefore, achievement.

The data were analyzed using an independent samples t test to account for the variability associated with the differences between the sample means for the comparison groups (i.e., inclusion and non-inclusion). The independent samples t test is comprised of two main parts; Levene's test for the assumption for equal variances and the t test for Equality of Means (Leech, Barrett, & Morgan, 2008). Measures of central tendency were calculated and analyzed; the average performance [mean] of each placement group on the NJ ASK mathematics scores and the spread of NJ ASK scores around the mean [standard deviation]. Inferential measures were also calculated and analyzed: t tests were used to determine whether the scores of the respective groups were significantly different from one another and an analysis of the influence of the independent/grouping variable of co-taught inclusion (general and special education teacher and general and special education

students) on the dependent variable of academic performance as measured by Grade 3 non-disabled students full scale and cluster scores.

Conclusions

The results of this investigation revealed that there was no statistically significant difference for overall mathematics performance ($t = .612$ with 97 *df* and $p = .542$), or Geometry and Measurement ($t = -.434$ with 97 *df* and $p = .665$), Patterns and Algebra ($t = 1.050$ with 97 *df* and $p = .296$), Data Analysis, Probability and Discrete Mathematics ($t = -.095$ with 97 *df* and $p = .925$) and Problem Solving ($t = .236$ with 97 *df* and $p = .814$) cluster scores on the NJ ASK for students placed in inclusion and non-inclusion classes. However, on Number and Numeric Operations ($t = 1.941$ with 30.2 *df* and $p = .062$), students placed in inclusion performed statistically significantly different [better] than students placed in non-inclusion classes. In other words, placement in a co-taught inclusive classroom did not influence the achievement of non-disabled students in mathematics with the exception of performance on Number and Numeric Operations when prior [pre] achievement is controlled.

One possible explanation for the anomaly of why non-disabled students placed in the inclusion class performed significantly better on Number and Numeric Operations is grounded in the theory that, “general education teachers and special education teachers bring a tremendous amount of knowledge and skills to the task of teaching and by being paired together, they pool their expertise” (Luzader, 1995, p. 19). Furthermore, according to Luzader (1995), general education teachers have a more in-depth understanding of specific curricula or subject areas being taught whereas, special education teachers generally know more about modifying and breaking down the curriculum and adapting

methodologies to meet the needs of individual children. By combining the two teachers (inclusion), general and special education children will benefit from a lower student to teacher ratio, access to a wider range of instructional strategies, and increased collaborative teacher support (Cook & Friend, 1995). It is possible that non-disabled inclusion students performed better in this area based upon the benefits of the team teaching model (e.g., lower student to teacher ratio, access to a wider range of instructional strategies, and increased collaborative teacher support). It is also possible that the non-disabled inclusion students were exposed to greater reinforcement of number sense skills (e.g., fractions, whole numbers through hundred thousands, place values), basic arithmetic operations (e.g., addition, multiplication, division) and estimation (e.g., more/less than, rounding, recognizing when an estimate is appropriate). It is more likely that students benefitted from a combination of the two; reinforcing, modifying and breaking down the curriculum and adapting methodologies to meet the needs of disabled students. Despite the statistically significant results for the Number and Numeric Operations cluster area, it is clear that the findings from the present study are consistent with previous researchers such as, Affleck, Madge, Adams, and Lowenbraun (1988); McDonnell, Thorson, Disher, Buckner, Mendel, and Ray (2003); and Sharpe, York, and Knight (1994).

Another possible explanation may be time on task. Inherent in this small sample, the results could be attributed the specific pair of co-teachers and their ability to differentiate/deliver instruction in this area. The co-teacher may have provided more review and reinforcement by breaking the students into smaller groups. Or the co-teacher may have pulled individual students aside to work with them individually or in small

groups to provide extra work on areas of perceived difficulty. Another factor may be the co-teacher ensured that the students were focused and on-task during direct instruction by general education teacher, and/or rephrased instruction and checked more frequently for comprehension.

Affleck et al. (1988) investigated how disabled and non-disabled students fared academically, when exposed to the Integrated Classroom Model (ICM). A nonequivalent control group design was employed comparing the academic achievement of 39 randomly selected general education students in grades 3 – 5 on the California Achievement Test (CAT). Data were collected and analyzed on the treatment (enrolled in ICM classrooms) and control (not enrolled in ICM classrooms) groups. The results did not indicate any statistically significant differences between the two groups. The researchers concluded that non-disabled students function similarly regardless of whether they are in the ICM or a regular classroom meaning, there were no distinguishable differences in reading, language, or mathematics achievement between those students in an ICM classroom and those in a non-inclusion classroom.

Results are also consistent with those obtained by Sharpe, York, and Knight (1994) who examined the effects of inclusion on the academic performance of students without disabilities. A post hoc, quasi-experimental, pre-test - post-test study using archival data was conducted comparing the academic performance of 35 students in a general education inclusive classroom with 108 general education peers who were not in an inclusive classroom (n=143). Academic performance in reading and mathematics along with effort and behavior were measured. The results of a one-way analysis of variance (ANOVA) did not indicate any statistically significant results on academic

(group achievement scores, report card ratings) or behavioral (conduct and effort) measures for either group.

Similarly, the results from this study are consistent with those from McDonnell et al. (2003) who completed an exploratory study which addressed the impact of inclusive educational programs on the achievement of students with developmental disabilities and their non-disabled peers. The researchers utilized a quasi-experimental, pre-test – post-test design, which involved 14 students with developmental disabilities in inclusive classrooms and 324 typical classmates and 221 typical students in non-inclusive elementary classes. Student performance was measured using the Utah Core Assessment (UCA), a criterion referenced achievement test. The results of a one way analysis of variance indicated no statistically significant difference in academic performance was achieved with respect to non-disabled students enrolled in inclusion classes and their non-disabled peers enrolled in non-inclusive classes

While many researchers have found that placement in inclusive classrooms does not negatively influence the academic achievement of non-disabled students others have found that it does (e.g., Fletcher, 2010; Huber, Rosenfeld, & Fiorello, 2001). Therefore, the results of this study were in contrast to those of Huber, Rosenfeld, and Fiorello (2001) who examined the differential impact of inclusion and inclusive practices on high, average, and low achieving general students. Achievement scores on the Metropolitan Achievement Test (MAC; 6th ed.) for 477 general education students from grades 1 through 5 were sampled. The researchers reported that inclusive school practices were found to have a differential effect in that, low achieving general education students appeared to benefit academically, while higher achieving students were adversely

impacted. General education students enrolled in the inclusion classes were not significantly affected in reading however, the effect was mixed in math. The analysis of the data suggests that inclusion and inclusive practices may lead to different rates of achievement for general education students. When compared to the present study, one potential reason for the difference in Huber, Rosenfeld, and Fiorello's results may be attributed to the delivery of the curriculum. Higher achieving students may not have been challenged due to possible teaching to the middle or intervention level. Lowering of the curriculum could also explain why low achieving general education students appeared to benefit academically.

Similarly, the results of this study were found to be inconsistent with those of Fletcher (2010) who examined the spillover effects of inclusion of classmates with emotional problems on test scores in early elementary education. The researcher conducted a cross-sectional study using a nationally representative longitudinal survey of kindergarten students. The participants ($n = 11,373$) were from both public and private schools and attended both full-day and part-day kindergarten programs and came from diverse socioeconomic and racial/ethnic backgrounds. Results indicate that having a classmate with an emotional problem reduces reading and math scores at the end of kindergarten and first grade by over 10% of a standard deviation, which is reported as one-third to one-half of the minority test score gap, approximately 40% of the adjusted Hispanic–White average difference in test scores and approximately 25% of the size of the adjusted Black–White test score gap. According to Fletcher (2010), the consistent result for mathematics and reading test scores indicate that students with classmates who have a serious emotional problem scored significantly lower than other students, though

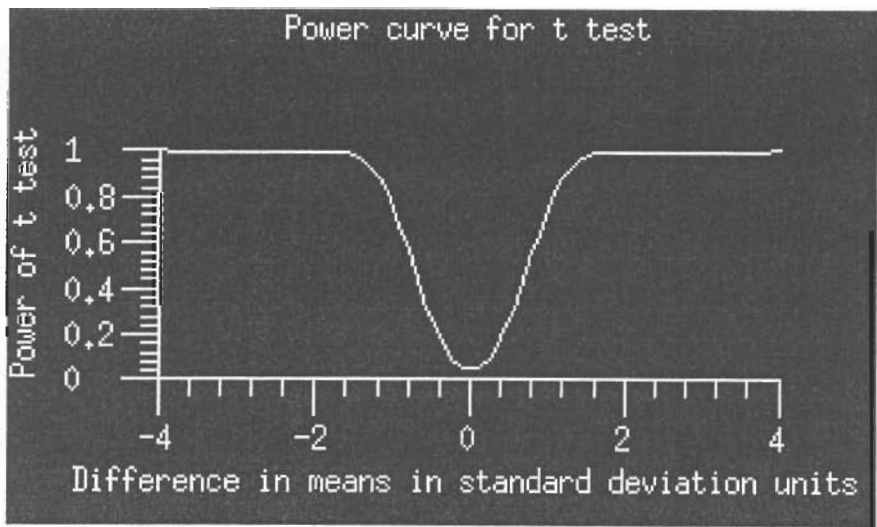
the results for reading were often not statistically significant. When compared to the present study, one potential reason for the difference in Fletcher's results may be attributed to the behavioral issues inherent with the inclusion of emotionally disturbed students in the general education setting. Even with the best trained teachers, the day to day distractions and resulting influence on teaching and instruction could have resulted in the lower performance of non-disabled included students. The researchers concluded that inferences that might be drawn from the results must be mediated by several factors that impose limitations on the study.

The present study also includes several factors that limit the generalizability of this study. First, there was a lack of random sampling which limits the researcher's ability to make inferences about the performance of the larger group [population]. Second, participants lacked diversity in terms of cultural background and socioeconomic status and therefore the findings cannot be generalized to urban, rural, or culturally diverse school settings. Third, the findings of this study remain tentative, but no less interesting, as a result of limited statistical power (.34) due to the small sample size of the inclusion group ($n=15$). The first and second limitations are fairly self explanatory; the third is more complex and requires further discussion.

Generally speaking, the t test requires at least 25 subjects in a group to protect against assumption violations (Witte & Witte, 2007). A critical assumption of the t test is that the variances (standard deviation squared) of the two groups are approximately equal. "Whether testing a hypothesis or constructing a confidence interval, t assumes that both underlying populations are normally distributed with equal variances"(Witte & Witte, 2007, p.302). With a small sample size, violations of assumptions such as non-

normality are difficult to detect even when they are present. According to the PROPHET StatGuide (1997):

Even if none of the test assumptions are violated, a t test with small sample sizes may not have sufficient power to detect a significant difference between the two samples, even if the means are in fact different. The power curve (Figure 1) presented in the results of the t test indicates how likely the test would be to detect an actual difference between the means. The shallower the power curve, the bigger the actual difference would have to be before the t test would detect it. The power depends on variance, the selected significance (alpha) level of the test, and the sample size. Power decreases as the variance increases, decreases as the significance level is decreased (i.e., as the test is made more stringent), and increases as the sample size increases. With very small samples, even samples from populations with very different means may not produce a significant t test statistic unless the sample variance is small. (p. 4)



From PROPHET StatGuide (1997, p. 4)

Figure 1. Power curve for t test.

Moreover, according to Cohen (1988) statistical tests look for evidence to reject the null hypothesis and conclude that a program had an effect. Cohen contends that with any statistical test, there is always the possibility that a difference between groups will be found when one does not actually exist (Type I error). Likewise, it is possible that when a difference does exist, the test will not be able to identify it (Type II error). He purports then that power refers to the probability that your test will find a statistically significant difference when such a difference actually exists (probability that you will reject the null hypothesis when you should). “Statistical power analysis exploits the relationship among the four variables involved in statistical inference: sample size (N), significance criterion (α), population effect size (ES), and statistical power” (Cohen, 1992, p.156). The relationship among these components is depicted in Figure 2. It is generally accepted that power should be .8 or greater; that is, you should have an 80% or greater chance of finding a statistically significant difference when there is one (Cohen, 1988). In this study the power was found to be limited (.34), that is, if the null hypothesis is rejected, there is only a 34% chance that it is a true finding. As a result of the limited power and local bias (i.e., geographic region where the study was conducted; homogeneity of ethnicity and socioeconomic status of participants in this study), it is not advisable to make widespread generalizations of the findings or to formulate implications for policy, practice and programs in other settings. However, despite the tentative nature of the findings, the information obtained in this study when combined with similar findings in the larger context of literature can be used by parents, teachers and administrators from the school where the data was drawn to make programmatic decisions to adopt or

enhance inclusive education programs. The results should drive local actions to study this issue more in the school of study.

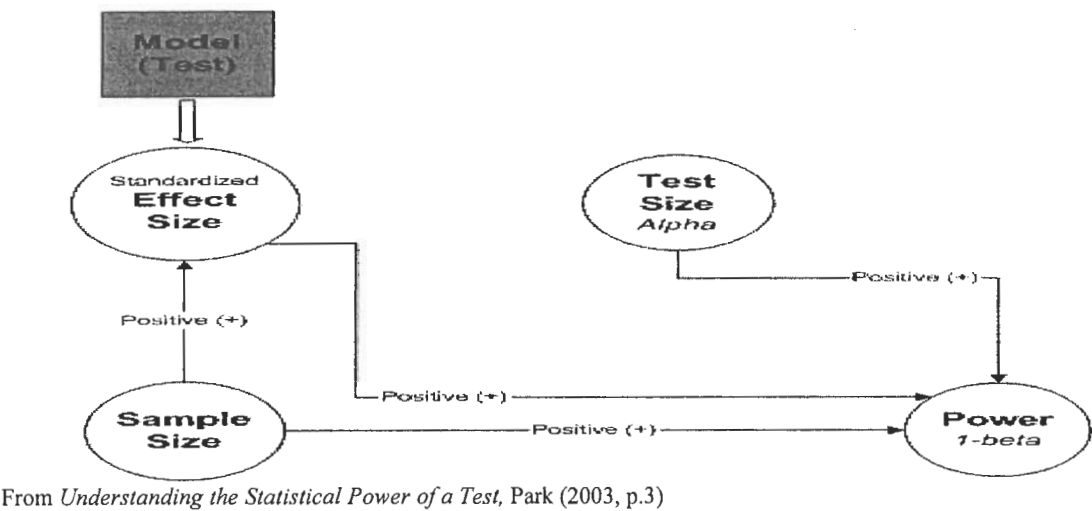


Figure 2. Statistical power: Relationships among the components.

The findings of this study could be used to assist local teachers and administrators as they attempt to develop effective inclusion programs and address concerns and fears of parents. Many concerns about educating disabled and non-disabled students together have been expressed specifically inclusion may result in a weaker curriculum for non-disabled students resulting in lower academic performance. In fact, the results suggest that on average, the inclusion classroom met the needs of non-disabled students in the classroom of study as measured by achievement in mathematics on standards driven criterion referenced state tests. Thus, the findings of this study can be shared with the parents of students placed in the inclusion classroom who may express concern or fear that placement will negatively influence their children academically. The findings can also be shared with the school faculty who believe that inclusion will force them to teach to the middle and not enrich on or advanced level students.

School administration will begin to expand on the findings by assessing the influence of co-taught inclusion on both disabled and non-disabled students in other curricular areas such as, language arts, science and social studies to see if similar findings can be found. Doing so has the potential to provide more evidence on the efficacy of inclusion programs in this school. Concomitantly, school administration will also begin to collect longitudinal data to track this and other cohorts of students across multiple settings and years in an effort to assess the sustainability and to rigor of the inclusion programs offered in the school and district. A comparison of pairs of team teachers will also ensue to identify best practices in co-teaching.

As a final point, while student interaction was not part of this study, teachers and school administrators noticed a change in the typical relations among students in the inclusion classroom. Thus, a Peer to Peer Program will be implemented to enhance the potential for social and emotional gains for both disabled and non-disabled students placed in inclusion classes. As highlighted in Chapter II, non-disabled students typically make affective gains such as empathy, increased self-esteem and a sense of responsibility (Peltier, 1997; Salend & Duhaney, 1999; Staub & Peck, 1995). While disabled students generally benefit from greater communication and developmental skills (Bennett, Deluca, & Burns, 1997), experience increased self-esteem and camaraderie by merely participating in general education classes (Ritter et al., 1999) and tend to make more friends in the general education classroom and interact with their peers at a much higher level (Fryxell & Kennedy, 1995). What is more, Fryxell and Kennedy's study examined the impact of educational placement in general education and self-contained classrooms on the social life of elementary-age students with disabilities. Results indicated that

students placed in general education had more social contact with peers without disabilities, received more social support, and had substantially larger friendship networks. Consequently, the Peer to Peer Program will focus on understanding diversity, tolerance of differences and leadership. It is hoped that all students will also make great strides in study skills and learning, and will successfully apply the friendship skills they practice in the program as they serve as role models for other students.

Recommendations for Future Research

This study highlighted issues and concerns regarding inclusion and the academic achievement of non-disabled students. The results suggest that placement in a co-taught inclusive classroom does not influence the achievement of non-disabled students in mathematics with the exception of performance on Number and Numeric Operations where they did better. Limitations to this study and threats to both internal and external validity have been presented and led to several recommendations for future research.

With a growing number of students served and specific provisions in legislation calling for more access to the general curriculum for these students, research on inclusive practices is imperative to understand its effects and barriers to overcome (USDOE, 2009). The review of recent literature on inclusion and the academic achievement of non-disabled students revealed that many researchers have reached the same conclusion as the present study specifically, that placement in an inclusive classroom does not have detrimental effect on the academic achievement of non-disabled students (Affleck et. al, 1988; McDonnell et al., 2003; Sharpe, York, & Knight, 1994). In an era of education reform movements that require LRE, accountability, and transparency, educators are continually examining variables that impact student achievement. Informing federal, state

and local level decisions through data-driven decision making should be the basis of school reform. Despite the growing body of knowledge, educators need more information concerning inclusion as it influences the academic achievement of both disabled and non-disabled students in an effort to continue forward progress toward the ultimate goal of supporting all students in achieving their greatest potential. To that end, there is a need for future research across a variety of conditions and settings, that is, size and geographic location of school/district and sample diversity in terms of socioeconomic status and ethnicity. Such study should sample students across the United States to provide a more comprehensive understanding of local influences on inclusive practices and academic achievement. Conducting a study of this magnitude could potentially minimize local effects and increase the generalizability of results. A larger sample size could also add to the statistical power therefore decreasing the likelihood that a test will find a statistically significant difference when such a difference actually exists.

Future research might also focus on student gender as an added variable when studying inclusion and academic achievement. Generally speaking, traditional gender gap theory indicates that girls tend to do better in liberal arts subjects, whereas boys typically perform better in math and science (Latham, 1997-1998). The question of gender differences in academic achievement is a continuing concern as researchers seek to address the performance gap in an effort to provide equity in education for all students. The multifaceted causes of gender discrepancies involve such wide-ranging factors as the sociological verses biological debate [nature nurture] (Salamone, 2003), which includes the influence of culture and home environment (Else-Quest, Hyde, & Linn, 2010); socioeconomic status (Drukker et al., 2009); brain-based and neurological differences

(Gurian & Stevens, 2005); and new state and federal testing policies (Gunzelmann & Connell, 2006). As a result, further investigation in this area is recommended.

This study primarily focused on the academic achievement of Grade 3 students in mathematics. Additional research incorporating multiple grade levels and curricular areas is also suggested. As students advance in grade, there is a need to examine the effects of inclusion longitudinally to assist educators in adjusting policy, practice and programs. It is equally important to study the effects of inclusion in content areas such as science and social studies. This is particularly important as science is now a state mandated tested area in grades 4 and 8 on the NJ ASK. Data should continue to be gathered that may present opportunities to improve student success in these areas.

Research efforts should also concentrate on comparing the various inclusion models as they relate to academic achievement. A number of pedagogical approaches have been developed and implemented in school districts across the United States. Research suggests that there is no single model of inclusion; rather, there are several models in terms of differing roles for teachers, that is, consultant model, team teaching model, parallel teaching model and cooperative teaching model (Gartner & Lipsky, 1997; National study on inclusion, 1995). While this study focused on the cooperative teaching model, further research comparing and contrasting the fidelity and efficacy of instructional delivery approaches is advised. Such study could influence the design of inclusion classrooms in the future.

Finally, to meet rigorous standards, teachers are now encouraged to differentiate instruction for a greater range of student ability levels. Teachers responsible for the education of students in this setting need specialized training, for example, instructional

approach, and instructional strategies (including but not limited to differentiated instruction, behavior/classroom management, and incorporating technology into the curriculum). Therefore, it is important to examine how teacher professional development influences the academic achievement of both disabled and non-disabled students placed in inclusion classrooms.

Summary

The results of this investigation revealed that placement in a co-taught inclusive classroom did not negatively influence the achievement of non-disabled students in mathematics, in fact non-disabled students performed better on Number and Numeric Operations. As a result of the limited power and local bias (i.e., geographic region where the study was conducted; homogeneity of ethnicity and socioeconomic status of participants in this study), it is not advisable to make widespread generalizations of the findings or to formulate implications for policy, practice and programs in other settings. However, despite the tentative nature of the findings, the information obtained in this study when combined with similar findings in the larger context of literature can be to the parents, teachers and administrators from the school where the data was drawn. The results should drive local actions to study this issue more in the school of study.

The findings can be used by school administration to parlay the fears of parents of participants who believe that inclusion may result in a weaker curriculum for their children resulting in lower academic performance. The findings can also be shared with the school faculty who believe that inclusion will force them to teach to the middle and not enrich on or advanced level students. As a result of this study, school administration will begin to: expand on the findings by assessing the influence of co-taught inclusion on

both disabled and non-disabled students in other curricular areas such as, language arts, science and social studies; collect longitudinal data tracking cohorts of students across multiple settings and years in an effort to assess the sustainability and rigor of the inclusion programs offered in the school and district; and as a springboard for a comparison of pairs of team teachers in an effort to identify best practices in co-teaching. Finally, it is recommended that future research focus on: expanding variables, e.g., size and geographic location of school/district, sample diversity in terms of socioeconomic status, gender and ethnicity and incorporating a larger sample size. Such study should sample students across the United States to provide a more comprehensive understanding of inclusive practices on academic achievement.

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Appendix A

Approval letter from the Superintendent of Schools granting permission to conduct this study

Appendix A

*Dr. Mary A. Kildow
Superintendent/Principal*

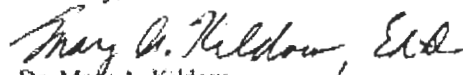
July 28, 2010

Seton Hall University
College of Education and Human Services
Jubilee Hall
400 South Orange Avenue
South Orange, New Jersey 07079

To Whom It May Concern:

This letter is an acknowledgement that Michael Trabucco has been granted permission to access and use all data requested for the purpose of research in preparation for completing his dissertation at Seton Hall University. All data are historical in nature and were collected during the 2009-2010 school year. Evaluation of data pertaining to students' test scores on the New Jersey Assessment of Skills and Knowledge 3 will also be provided. Please note that only unique student identification numbers, which cannot be linked to student names, will be on the data files to ensure anonymity of all students.

Sincerely,


Dr. Mary A. Kildow
Superintendent of Schools

"Understanding Through Knowledge"

Appendix B
Grade 3 Mathematics Curriculum Map

| Third Grade | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | April | May | June |
|--------------------------------------|--|---|---|--|---|---|--|--|---|--|
| C O N C E P T S | <ul style="list-style-type: none">• Problem Solving• Organization, Sorting, Classifying and Graphing• Addition and Subtraction of Numbers• Patterns• Place Value (0-1,000) | <ul style="list-style-type: none">• Problem Solving• Addition and subtraction of larger numbers• Fact Families• Rounding Numbers• Ordinal Numbers• Estimate• Less and Greater terminology• Standard Expanded• Calendar• Time | <ul style="list-style-type: none">• Problem Solving• Money• Decimals relating to money• Subtracting larger numbers (3 and 4 digits)• Estimating differences• Place Value (0-million)• Rounding Larger numbers• Regrouping (add and subtract) | <ul style="list-style-type: none">• Problem Solving• Continue Estimation• Introduce repeated addition• Introduce equal groups and sets (multiplication) | <ul style="list-style-type: none">• Problem Solving• Mastery of multiplication facts 0-12• Multiplying 3 factors• Introduction to Division | <ul style="list-style-type: none">• Problem Solving• Division Concepts and facts• Basic Long Division with remainders | <ul style="list-style-type: none">• Problem Solving• Geometry• Customary and metric Measurement (capacity, weight, length, and temperature)• Fractions• Standardized Testing preparation | <ul style="list-style-type: none">• Problem Solving• Standardized Testing Review• Review all Math Concepts Sept-April• Mastery of multiplication facts 0-12 | <ul style="list-style-type: none">• Problem Solving• Review Concepts in Depth: Multiplying 3 digit numbers, multiplying with money, division, estimating products• Expand on Fractions and Decimals | <ul style="list-style-type: none">• Problem Solving• Expand on Measurement and Geometry |

| | | | | | | | | | | |
|----------------------------|---|---|--|--|--|--|---|---|--|---|
| S K I L L S | <ul style="list-style-type: none">• Find patterns to solve problem• Read word problems, highlight important information, draw representation of the problem, make organized list and solve• Gather, sort, classify and graph information• Analyze and create pictographs, pie graphs, bar graphs and tables to represent information• Write word problems | <ul style="list-style-type: none">• Make a schedule to solve problems• Choose appropriate operation while problem solving• Check subtracting by adding• Identify fact families, look for relationship between numbers• Round numbers based on different place values (tens, hundreds and thousands)• Write ordinal numbers• Estimate numbers• Read and write numbers in standard and expanded form• Read and analyze a calendar• Tell and write time on an analog clock to the minute• Elapsed time | <ul style="list-style-type: none">• Utilize deductive reasoning to solve problem• Use objects to solve problems• Use multiple steps to solve problems• Writing explanations after problem solving• Identify coin value• Add/sub mentally and saying answers orally• Add 2-3 digit numbers (apply place value skills) | <ul style="list-style-type: none">• Draw a picture to solve problems• Recognize important information in a problem• Subtract 4 digit numbers by borrowing• Explain the operation of multiplication (when do you do equal sets, repeated addition)• Memorize multiplication facts 0-5 | <ul style="list-style-type: none">• Make a table draw pictures to solve problems• Memorize Multiplication facts 0-12• Multiply numbers with 3 factors• Use multiplication n to divide | <ul style="list-style-type: none">• Choose an operation to solve a problem• Explore division as sharing and repeating subtraction• Use multiplication n to divide• Divide numbers with remainders | <ul style="list-style-type: none">• Solve problems by solving simpler problems and find patterns• Identify solid and plane geometric shapes• Congruent figures and lines of symmetry• Find perimeter and area• Find and name points on a coordinate grid• Measure all objects to the nearest 1/4 inch• Compare measurement in inches, | <ul style="list-style-type: none">• Use objects and draw pictures to solve problems• Review all the skills taught from September through April• Practice skills | <ul style="list-style-type: none">• Make a table to solve problem• Name and write tenths and hundredths as decimals• Add and subtract decimals• Add and subtract fractions• Add and Subtract decimals• Explore multiplication and division patterns• Estimate product and quotients• Multiply two and three digit numbers | <ul style="list-style-type: none">• Review all problem solving strategies taught throughout the year• Determine volume and capacity• Identify lines, line segment, rays, parallel, intersecting lines.• Explore angles, slides, flips and turns. |
|----------------------------|---|---|--|--|--|--|---|---|--|---|

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|--|--|--|---|--|--|--|---|---|--|
| | <ul style="list-style-type: none"> from graphed information Use a key in a graph Compare numbers Choose correct operation when adding and subtracting Analyze and discover patterns in numbers Demonstrate mastery of addition and subtraction facts Read and write numbers through 100,000 | | <ul style="list-style-type: none"> Round and estimate differences Compare larger numbers and determine less or greater than Explain and solve subtraction problems by regrouping | | | | <ul style="list-style-type: none"> Feet, yards and miles Identify, add and subtract fractions with like denominator | <ul style="list-style-type: none"> Multiply with money Mental math with multiplying | |
|--|--|--|---|--|--|--|---|---|--|

| | | | | | | | | | | |
|--|---|---|--|---|--|---|--|---|---|---|
| EQ SU SE ES NT TI IO AN LS | <ul style="list-style-type: none">• What steps should I use to solve a problem?• How do I create a graph?• How do I add more than 2 #'s?• How do I subtract? | <ul style="list-style-type: none">• Why is a schedule important?• How do I know which operation to use?• How do I find the place value of a number?• How do I add through the thousands?• How do I round and estimate numbers?• What is the difference between expanded and standard form? | <ul style="list-style-type: none">• What strategies are needed in solving problems?• What value do various coins have?• Why do I round off numbers?• When do I need to regroup numbers? | <ul style="list-style-type: none">• What strategies are needed in solving problems?• How do I estimate differences?• How will I learn to multiply?• Where will I use multiplication? | <ul style="list-style-type: none">• What strategies are needed in solving problems?• What are some ways to memorize numbers?• Why do I multiply numbers?• How do I multiply?• What's division? | <ul style="list-style-type: none">• What strategies are needed in solving problems?• How does division relate to multiplication?• How do I divide numbers with a remainder? | <ul style="list-style-type: none">• What strategies are needed in solving problems?• What is the difference between the different measurements?• In what ways do I use geometry in our daily lives?• How do I measure different types of objects?• What are fractions? | <ul style="list-style-type: none">• What strategies are needed in solving problems?• What are important skills and concepts that I need to practice? | <ul style="list-style-type: none">• What strategies are needed in solving problems?• What information must I use to multiply, divide, and estimate larger numbers?• How do I add and subtract fractions and decimals? | <ul style="list-style-type: none">• What strategies are needed in solving problems?• What do you do to determine the volume of an object?• What are the major concepts in geometry? |
|--|---|---|--|---|--|---|--|---|---|---|

| | | | | | | | | | | |
|-------------|--|---|--|--|---|---|---|--|--|---|
| ASSESSMENTS | <ul style="list-style-type: none"> • Create a graph • Differentiate between diff. graphs • Solve add and sub problems • Represent word problems by choosing correct operation, drawing a representation and explaining their answers • Teacher-made tests • Publishers' Tests • Timed Fact Drills • Teacher Observation • Create Patterns • Math Journal | <ul style="list-style-type: none"> • Create own word problems • Teacher-made tests • Publishers Test • Timed Fact Drills • Teacher Observation • Math Journal | <ul style="list-style-type: none"> • Show value of coins by listing the differences and choosing the correct coins • Create own word problems • Teacher-made tests • Publishers' Tests • Timed Fact Drills • Teacher Observation • Math Journal • <u>Make</u> a poster using grocery flyer, add total and sub. | <ul style="list-style-type: none"> • Teacher-made tests • Publishers Test • Timed Fact Drills • Teacher Observation • Math Journal • Create own multiple step word problems for classmate to solve | <ul style="list-style-type: none"> • Teacher-made tests • Publishers Test • Timed Fact Drills • Teacher Observation • Create own word problems • Math Journal | <ul style="list-style-type: none"> • Teacher-made tests • Publishers Test • Timed Fact Drills • Teacher Observation • Create own word problems • Math Journal | <ul style="list-style-type: none"> • Teacher-made tests • Publishers Test • Timed Fact Drills • Teacher Observation • Math Journal • Standardized Testing | <ul style="list-style-type: none"> • Daily quiz review • Teacher-made tests • Publishers Test • Timed Fact Drills • Teacher Observation • Math Journal • Standardized Testing | <ul style="list-style-type: none"> • Teacher-made tests • Timed Fact Drills • Teacher Observation • Create own word problems • Math Journal | <ul style="list-style-type: none"> • Teacher-made tests • Publishers Test • Timed Fact Drills • Teacher Observation • Create own word problems • Math Journal |
|-------------|--|---|--|--|---|---|---|--|--|---|

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|----|-----------|---------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| ST | • 4.1 4.3 | • 4.1 4.5 4.3 | • 4.1 4.5 | • 4.1 4.5 | • 4.1 4.5 | • 4.1 4.2 | • 4.1 4.2 | • 4.1 4.5 | • 4.1 4.2 |
| AN | 4.1 4.5 | | 4.3 | 4.3 | 4.3 | 4.5 | 4.3 4.5 | 4.3 | 4.5 4.3 |
| DA | | | | | | | | | |
| RD | | | | | | | | | |

